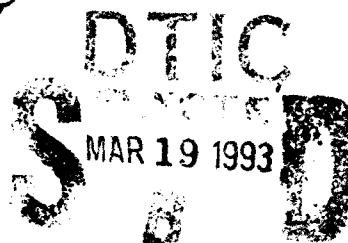




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NAVAL POSTGRADUATE SCHOOL

Monterey, California



THESIS

QUICKTRANS AND ALTERNATIVE COMMERCIAL
TRANSPORTATION: A COST COMPARISON

by

Gregory B. Chitwood

December, 1992

Thesis Advisor:

Dan C. Boger

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**QUICKTRANS and Alternative Commercial
Transportation: A Cost Comparison**

by

Gregory B. Chitwood
Lieutenant Commander, United States Navy
B.A., University of Oregon, 1976

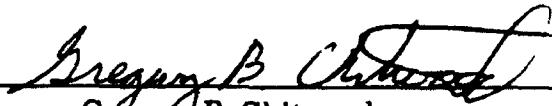
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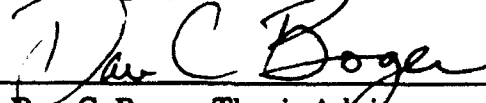
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ABSTRACT

The purpose of this thesis is to determine if the Navy's QUICKTRANS system could be replaced with a more cost effective combination of commercial air freight and trucking service. QUICKTRANS is used to transport DOD cargo between major continental United States Navy operating sites. The history, components, billing structure, and total cost of the QUICKTRANS system are described. Types of material moved as QUICKTRANS shipments are examined with particular emphasis on dirty freight shipments, those which require special handling. A cost model is developed to estimate the cost of moving cargo currently shipped in QUICKTRANS by readily available alternative commercial transportation assuming four different scenarios for determining which shipments move by premium air transportation. The cost for QUICKTRANS compares favorably with the cost required for alternative commercial transportation as computed by the cost model. Continued QUICKTRANS operation is recommended unless the shipment volume continues to decline in FY 93.

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I. INTRODUCTION

A. GENERAL

Fast and reliable transportation of high priority cargo needed to support Navy activities is a critical requirement in sustaining operational readiness. In the continental United States (CONUS), the Quick Transportation (QUICKTRANS) system has been used to meet this requirement for most urgent Navy shipments since 1950.

QUICKTRANS is a network of truck and airlift routes tied together by terminal services at the airlift nodes. All transportation is provided by commercial vendors under contract to provide trucking, airlift, or terminal services. The Navy Material Transportation Office (NAVMTO) is responsible for government oversight and coordination of QUICKTRANS. Shippers are charged shipping fees to cover QUICKTRANS contract costs.

The primary mission of QUICKTRANS is to move cargo via airlift and truck service in order to provide a controlled, flexible, and responsive method of expediting urgently required cargo between points of major Navy interest within the Continental United States [Ref. 1: p. 5]. All CONUS Navy shippers are encouraged to use QUICKTRANS if the shipment destination is a QUICKTRANS point and QUICKTRANS can meet required delivery dates. Consequently, QUICKTRANS moves a large amount of cargo: 61,973 tons in fiscal year (FY) 1991 [Ref. 2: p. 10]. For comparison, Federal Express moved 959,700 tons of freight during their fiscal year from 1 June 1991 through

31 May 1992 [Ref. 3].

Commercial air freight forwarders have claimed to be able to move Navy high priority cargo more quickly and with less cost than QUICKTRANS. The possibility of replacing QUICKTRANS with an alternative commercial air freight forwarder has been studied. In 1983, Holden and Weber concluded Emery Air Freight could replace QUICKTRANS and provide comparable service for slightly less money than spent on all QUICKTRANS contracts [Ref. 4: p. 91]. Looking at the same data, McBurney concluded QUICKTRANS was the preferred alternative in 1986 [Ref. 5: p. 58].

However, the environment in which QUICKTRANS operates has changed radically since 1986. Specifically, Defense Management Review Decision 902 has changed wholesale stock distribution responsibilities within the Department of Defense, a major component of the Defense Transportation System has ceased operations, competition among commercial freight forwarders has intensified, and a lowered global threat to United States security has resulted in Department of Defense (DOD) downsizing.

1. Defense Management Review Decision 902

Defense Management Review Decision (DMRD) 902 grew from a review of Defense management conducted by a special commission appointed by President Reagan in 1985. Ultimately known as the Packard Commission, the panel outlined specific recommendations for improvements in the areas of management framework, planning, and acquisition. DRMDs are a procedure used by DOD to address the Packard Commission recommendations.

The purpose of DMRD 902 is to consolidate the CONUS service supply depots under the Defense Logistics Agency (DLA).

Assistant Secretary of Defense for Production and Logistics Colin McMillian approved DLA's October 1990 Supply Depot Consolidation Plan to create a standard DOD wholesale physical distribution system under DLA Management. The DLA plan consolidated distribution operations at 30 service depots in the continental United States, including the 7 CONUS Naval Supply Centers. The objective is to achieve standardized and optimal policies and procedures to reduce distribution costs while supporting force readiness. [Ref. 6: p.6]

As a result of Defense Management Review 902, control of storage and distribution for Navy wholesale material has been transferred from Navy Supply Centers (NSCs) to DLA. NSCs have been the largest QUICKTRANS customers. Shipping wholesale supply system material, NSCs accounted for fifty percent of all QUICKTRANS movements by weight and reimbursed over fifty-two percent of QUICKTRANS total operating costs in FY 1991 [Ref. 2: p. 10].

DLA is not required to ship high priority wholesale material via QUICKTRANS. If DLA can not be convinced to use QUICKTRANS for freight of all kinds (FAK) as NSCs previously did, remaining QUICKTRANS users will see much higher QUICKTRANS shipping costs as the fixed costs of QUICKTRANS will be spread over fewer units to be shipped.

2. Defense Transportation System

The Defense Transportation System is comprised of the following components:

1. Military controlled terminal facilities.
2. Military Sealift Command controlled or arranged sealift.

3. Government controlled air or land transportation.
4. Air Mobility Command¹ controlled or arranged airlift including Logistic Airlift (LOGAIR) and QUICKTRANS. [Ref. 7: p. 1-A-1]

Roughly the Air Force's equivalent of QUICKTRANS, LOGAIR ceased operation on 1 October 1992.

Air Force Secretary Donald Rice on Friday said the service will use commercial overnight carrier services and surface transportation to move cargo, saving \$80 million a year. Rice said the Air Force will end its stateside Logistics Airlift system, under which for 40 years it had contracted commercial airlines to move high priority cargo. "The change to a new system is a result of the Air Force's downsizing and defense reorganization," he said. The new plan will be implemented Oct. 1. [Ref. 8]

The elimination of LOGAIR will lead DOD and Congressional representatives to question how the Navy can continue to justify the QUICKTRANS operation. Central to QUICKTRANS justification is the cost of QUICKTRANS service when compared to the cost of readily available commercial transportation alternatives similar to those replacing LOGAIR functions for the Air Force.

3. Competition in Commercial Air Freight Industry

QUICKTRANS is primarily an air freight system. Thus, competition for QUICKTRANS high priority shipments comes from the commercial air freight forwarders. Competition in the commercial air freight industry has been intense

¹The Air Mobility Command (AMC) was formerly known as the Military Airlift Command (MAC), a major command within the Department of the Air Force. For consistency, Air Mobility Command, or AMC, vice Military Airlift Command, or MAC, is used throughout this thesis to designate the Air Force command responsible for air movement of DOD material to overseas operating sites.

since deregulation in the early 1980s. In the 1990s, price competition has accelerated.

In virtually every part of the industry, carriers are bemoaning overcapacity, declining yields and rates that many call ridiculously low. If overcapacity is the main problem for underpriced carriers, Scherck {President of Colography Group, a consulting group} offers little hope for the future. He said air cargo shipments will double in the next decade. "But growth in the market will not absorb the capacity that will come into the market," he said. [Ref. 9: p.38]

Firms are willing to discount rates to capture government freight business, especially since commercial demand for transportation services has been slowed by the 1991 recession. Rates have been sharply reduced in some cases as the following example illustrates. Federal Express started a price war for large accounts when it won the General Services Administration's massive overnight shipment contract in 1990.

Federal presaged the past year's use of deep rate cuts to win big contracts in 1990 when it took the government bid away from Airborne, which had moved the government's overnight letters for two years. "They were frightened by the pricing on the GSA contract," said Schlesinger, an analyst with Donaldson, Lufkin and Jenrette. "Federal's pricing was dramatically lower than anyone else's. I calculated it could have been 50 percent higher and they still could have won the contract." [Ref. 10: p. 32-33]

Air freight rates have declined. Falling rates hurt the competitive position of QUICKTRANS vis-a-vis commercial air freight forwarders and are unlikely to rise substantially in the near future.

4. Department of Defense Downsizing

The Department of Defense is currently undergoing a significant reduction in budget and operating forces. From a recent high of 6.5 percent of gross domestic product in FY 1987, DOD outlays had fallen to 4.9 percent of gross domestic product in FY 1992. The President's 1993 budget predicts further reductions to 3.6 percent of

gross domestic product by 1997. In FY 1987 constant dollars, defense outlays are expected to continue to decline from 282.0 billion in FY 1987 to 207.3 billion by FY 1997. [Ref. 11]

The number of QUICKTRANS shipments has declined over the same period. Regardless of the number or weight of material shipped, the total cost for QUICKTRANS service remains fairly constant because most QUICKTRANS contract costs are fixed. A fall in the number of shipments sent via QUICKTRANS translates to higher shipping fees for the remaining shippers. Downsizing may lead to a point where the number of shipments needed to economically reimburse QUICKTRANS contract costs can no longer be sustained.

B. PURPOSE

The purpose of this thesis is to determine if the Navy's QUICKTRANS system could be replaced with a more cost effective combination of commercial air freight and trucking services. Specifically, the following primary research question is purposed:

1. How do the total costs of shipping cargo via QUICKTRANS compare with shipping the same material via readily available alternative commercial transportation systems?

The following secondary questions are considered pertinent in addressing the above research question:

1. How has the QUICKTRANS system evolved to serve Navy high priority continental United States shipping needs?
2. What type of material does QUICKTRANS move?
3. What is the cost of the QUICKTRANS system?

4. What is the cost of shipping QUICKTRANS material via alternative commercial transportation?
5. What aspects of QUICKTRANS service are clearly superior or inferior to other commercial carrier operations?
6. How will the termination of the Logistic Air System (LOGAIR) in October 1992 affect QUICKTRANS operations and costs?

C. THESIS APPROACH

This thesis examines the QUICKTRANS system and readily available commercial alternatives in five areas that address the above stated purpose and secondary questions. First, the development of QUICKTRANS is discussed in order to understand the present system. The parts that comprise the QUICKTRANS system are reviewed. QUICKTRANS contract contents and administration are probed.

Second, the types of material moved in QUICKTRANS are studied. Particular attention is paid to "dirty freight" shipments which require special handling for air transport. NAVMTO billing policies which differ depending on the type of freight moved and the distance moved are then detailed and contrasted with other commercial freight services.

Third, QUICKTRANS costs are examined. Monetary payment for QUICKTRANS service is highlighted, but other costs to the government which are incurred while providing QUICKTRANS service are also discussed. For cohesion, the method used to recover contract costs by billing customers for shipments is reviewed.

In the fourth area, commercial air and truck rates offered for movement of government freight are applied to four months of actual QUICKTRANS shipments.

Shipment costs are broken down into freight categories that highlight the high cost of providing QUICKTRANS dirty freight services by other commercial carriers. Assumptions required to make a direct dollar comparison are detailed. Further, commercial costs for moving material currently moved by QUICKTRANS are broken down into four separate categories: 1) replacement of QUICKTRANS by commercial carriers providing the same type of air or ground shipment currently used by QUICKTRANS, 2) replacement of QUICKTRANS where only the highest priority shipments as determined by required delivery date (RDD) are moved by commercial air freight and other shipments are moved via ground transportation, 3) a replacement of QUICKTRANS where only the highest priority shipments as determined by transportation priority (TP) are moved by commercial air freight and other shipments are moved by trucks, and 4) a replacement of QUICKTRANS similar to LOGAIR's replacement system where only normal very high priority shipments based on RDD are moved by overnight air and all dirty freight shipments, regardless of priority, are diverted to ground transportation.

Finally, a comparison of QUICKTRANS and commercial shipment costs will be made with recommendations for QUICKTRANS continued operation, termination, or further research.

1. Scope

The thrust of this thesis is developing a cost model that accurately compares QUICKTRANS shipment costs with commercial carrier cost. Areas specifically investigated include QUICKTRANS cost and billing structure, types of QUICKTRANS

shipments, and alternative commercial carrier cost for similar service. DOD and Navy shipping regulations, carrier selection, and service requirements will be researched and compared.

The underlying reasons for regulations which require QUICKTRANS shipment or DOD use of the least cost carrier is beyond the scope of the research. Proposed future regulation changes, upgrades in QUICKTRANS service or shipment status systems, possible improvements in technology or billing structure, and improved commercial service for QUICKTRANS "dirty freight" functions are not germane to this study.

2. Methodology

Methodology includes developing a cost model that accurately reflects the approximate cost for shipping different types of freight in QUICKTRANS via alternative commercial sources. Cost data will be collected from tenders for government transportation service and the Navy Material Transportation Office (NAVMTO). Statistical methods will be used to approximate costs or quantities of shipments based on representative samples when required data cannot be determined by aggregating available information.

Information to be used in this thesis entails previously published research on QUICKTRANS, data from the QUICKTRANS computer data base accessed by NAVMTO, observation of QUICKTRANS operations, and interviews of QUICKTRANS

contractors, QUICKTRANS customers, NAVMTO, the Naval Supply Systems Command, DLA, and commercial carrier representatives.

3. Organization

This thesis is divided into seven chapters: an introduction, five research chapters and a summary chapter which includes conclusions and recommendations. Chapter II includes the history of QUICKTRANS, a breakdown of its component parts, and the contracts used to implement the system. Chapter III shows the type of material moved in QUICKTRANS and recent trends in system utilization. Chapter IV summarizes QUICKTRANS costs and the billing structure used to charge participating shippers for total QUICKTRANS system costs. Chapter V develops the commercial cost for shipping material currently moved by QUICKTRANS in separate freight categories and under four separate scenarios for determining what percentage of shipments would be moved by premium overnight air transport. Chapter VI summarizes the difference between QUICKTRANS costs and the four alternative commercial transportation scenarios and indirect costs expected if QUICKTRANS is replaced. Chapter VIII summarizes the research chapters and provides conclusions and recommendations.

II. BACKGROUND

This chapter discusses QUICKTRANS history, objectives, and composition. A review of these areas is needed to understand what QUICKTRANS is and how it operates.

A. HISTORY

The Korean War highlighted a need for high priority air transportation of Navy material that could not be met by an infant commercial air cargo industry. Commercial movement of hazardous and irregularly-shaped or large cargo pieces was particularly difficult. Consequently, the Navy originated a dedicated air transport system in July, 1950: QUICKTRANS Contract Airlift Services [Ref. 12: p. 6].

Since its inception, QUICKTRANS has specialized in the movement of "dirty" as opposed to "clean" freight. Dirty freight is cargo that requires special handling and/or documentation. Dirty freight moved in QUICKTRANS includes hazardous material, material requiring temperature-control, security shipments for sensitive or classified material, and outsized shipments which usually require more than one pallet position for air movement.

QUICKTRANS also moves high priority clean freight shipments. Clean freight is cargo that requires no special handling. It is easily consolidated to maximize available airlift capacity on one pallet position. In the commercial sector, air freight forwarders

like Federal Express and United Parcel Service specialize in movement of clean shipments.

By 1974, QUICKTRANS had expanded to include some truck movements. In 1980, additional ground transportation was added with the beginning of Consolidated Truck (CONTRUCK) and the Northeast Dedicated Truck System (NDTS). Both of these ground transportation trucking routes were totally incorporated as part of the QUICKTRANS system by 1990.

Automation of QUICKTRANS booking, movement, and tracking services began with the Computer Management Information System in the late 1970's. This system was contractor owned and operated until 1990 when the government replaced the system with the QUICKTRANS data base. The QUICKTRANS data base is primarily government controlled and operated, although the contractor is responsible for entering shipment information into the data base.

The QUICKTRANS system expanded to include cargo consolidation in the late 1980s. Performed at the Norfolk, Virginia, and Travis Air Force Base, California QUICKTRANS airlift nodes, Navy overseas shipments were consolidated in 1988 to take advantage of discount pricing for large shipments prior to movement by sea or air by the QUICKTRANS terminal contractor. A similar program for expediting and consolidating vendor shipments prior to overseas movement was included under the QUICKTRANS umbrella beginning in 1989.

B. OBJECTIVE

The Naval Supply Systems Command (NAVSUP) is responsible for Navy transportation management. Objectives for the QUICKTRANS system are:

1. Optimize the utilization of QUICKTRANS within CONUS to provide a single effective system for transporting high priority Navy material which directly or indirectly supports the fleet. This includes providing the lift capability for the CONUS segment shipments moving via the Military Airlift Command to overseas destinations.
2. Operate QUICKTRANS as a segment of the DOD Transportation System under the direction and control of NAVSUP.
3. Develop and guide the peacetime employment of the QUICKTRANS Airfreight System in a manner that will enhance emergency and wartime Navy and Marine Corps transportation, achieve greater flexibility and mobility of material and equipment, and logistics effectiveness and economy. [Ref. 13: p.1]

QUICKTRANS has satisfied the above stated objectives for many years. However, the combination of DLA removing freight from QUICKTRANS as a result of DMRD 902 and recent DOD downsizing makes optimal utilization of QUICKTRANS more difficult simply because there is not as much high priority Navy freight to move in CONUS.

QUICKTRANS is a part of the DOD Transportation System but its continued operation is not mandated by higher authority. The elimination of LOGAIR by the Air Force clearly illustrates the point that QUICKTRANS operates as a segment of the DOD Transportation System at the Navy's discretion.

The relevance of the third objective should not be overlooked. During Desert Shield and Desert Storm, QUICKTRANS shipments surged from approximately 35,000 to over 52,000 air shipments monthly. This cargo funnelled directly from

QUICKTRANS to AMC terminals using compatible pallets and material handling equipment. Commercial air freight pallets are not compatible with AMC aircraft, so freight arriving via commercial carrier must be moved from commercial to AMC pallets before loading on AMC aircraft. Although this thesis focuses on cost, the compatibility of QUICKTRANS and AMC transportation is a real operational issue.

C. COMPONENTS

QUICKTRANS is defined as the Navy-managed contract airlift and commercial truck distribution system for movement of cargo that is high priority, outsized, or requires special handling [Ref. 14: p. 2]. The QUICKTRANS system can be divided into five separate components: airlift, ground transport, terminal services, and government oversight.

1. Airlift

The airlift component of QUICKTRANS is often confused with the entire QUICKTRANS system because both are referred to as "QUICKTRANS". For clarity, the airlift portion of the QUICKTRANS system is referred to as QUICKTRANS airlift in this thesis.

QUICKTRANS airlift is essentially an air freight forwarder for high priority cargo that specializes in outsized, security, and hazardous shipments.

Air transport is made aboard Lockheed 100-30 aircraft. Use of Lockheed 100-30s (a civilian version of the C-130 military aircraft) is a contract requirement to ensure compatibility with Military Aircraft Command material handling equipment and

463L military pallets [Ref. 15: p. B-9 and C-1]. The requirement for Lockheed 100-30 aircraft ensures that the third objective of QUICKTRANS, enhancing emergency and wartime Navy and Marine corps transportation, is facilitated through compatibility with AMC pallets and material handling equipment.

A total of 25 QUICKTRANS airlift flights are scheduled each week between nine QUICKTRANS terminals. One round trip cross country flight is operated daily. Four terminals receive QUICKTRANS airlift flights five days a week, one twice a week and the other four terminals receive flights daily. Except for Indianapolis, Indiana, all the airlift terminals are located on Navy or Air Force bases. For specific airlift terminals and weekly flight schedules, see Appendix A.

a. QUICKTRANS Airlift Contract

In addition to the general conditions noted above, the QUICKTRANS Airlift Contract includes several other unique clauses. Contract provisions are summarized below:

1. The contract is issued by the Military Airlift Command and administered by NAVMTO.
2. L-100-30 aircraft capable of accommodating an 108 by 88 inch large 463 pallet are mandated.
3. Aircraft fuel is provided free by the government.
4. Procedures for movement of hazardous, SECRET, confidential, sensitive, and highly pilferable cargo are detailed.
5. A great deal of route flexibility is written into the contract. QUICKTRANS airlift flights will go wherever NAVMTO decides service is required.

6. The contractor is paid based on yearly contract mileage times a price per mile. Flights may be canceled by the government, but the government must still pay a suspension rate charge of 38 percent of the normal contract mileage for the flight. [Ref. 15]

Costs associated with QUICKTRANS airlift cannot be decreased without affecting QUICKTRANS transportation times. Even if NAVMTO is willing to increase transportation times by canceling scheduled airlifts, the government must still pay 38 percent of the charge for a loaded aircraft. Consequently, QUICKTRANS airlift costs under the contract are almost fixed in nature: if QUICKTRANS airlift flight schedules are maintained, the government must pay the cost of commercial airlift.

QUICKTRANS airlift costs are also impacted by the contract requirement to use L-100-30 aircraft and be compatible with Air Force 463L pallets. These requirements have made the airlift portion of the contract virtually a sole source contract award since only Southern Air Transport meets the stringent contract requirements [Ref. 5: p.17].

2. Ground Transport

Two separate ground transportation networks connect QUICKTRANS service points with the airlift terminals. Both networks use truck transportation. They are discussed in turn.

a. Consolidated Truck (CONTRUCK)

The CONTRUCK system operates between QUICKTRANS airlift terminals and QUICKTRANS service points located at various Navy and Marine Corps bases. The formal definition of CONTRUCK describes the system well:

CONTRUCK is a Navy-managed, truck-based system that augments the QUICKTRANS airlift system. The CONTRUCK system employs a motor carrier to transport routine, lower priority, Less than Truckload (LTL) shipments between the East and West coasts, and between Norfolk, VA and points in the Southeast. [Ref. 14: p.4]

Like QUICKTRANS airlift, CONTRUCK is certified to carry hazardous material and material requiring DOD Constant Surveillance Service (CS) or a signature and Tally Record Service (ST). Commercial vendors operate CONTRUCK trucks, and perform terminal consolidation and distribution efforts. The contract vehicles for CONTRUCK are guaranteed traffic awards (GTAs) awarded by the Military Traffic Management Command (MTMC) to the lowest cost responsible carrier. CONTRUCK routes are shown in Appendix B.

b. Northeast Dedicated Truck System (NDTS)

The NDTS system operates trucks between the major QUICKTRANS system hub at Norfolk, Virginia and Navy and Marine Corps activities in the Northeastern United States. To ensure compatibility with the rest of the QUICKTRANS system, hazardous, outsized, and security shipments are accepted for transport.

A single motor carrier provides NDTS service. MTMC awards NDTS freight to the lowest cost carrier on a guaranteed traffic award. NDTS routes are shown in Appendix C.

3. Terminal Services

Terminal operations are performed by contractor personnel at the seven of ten QUICKTRANS airlift nodes. The airlift nodes at Patrick Air Force Base (AFB),

McCord AFB, and Charleston AFB are staffed by Air Force personnel. At the CONTRUCK and NDTs service points, most terminal operations are performed by assigned Navy or Marine Corps personnel.

The terminals tie QUICKTRANS airlift, Consolidated Truck, and the Northeast Dedicated Truck Service into a single system. Contractor terminal operations include loading and unloading freight, updating the government furnished QUICKTRANS data base with shipment status, and being able to provide other normal freight terminal services. Special services include the extra documentation and handling needed to move hazardous shipments, outsized shipments (exceeding 72 inches in any dimension), and signature service for security shipments. However, the terminals are basically break-bulk operations.

a. Terminal Services Contract

All detailed terminal requirements are listed in a comprehensive terminal services contract. The contract was solicited by the Naval Regional Contracting Center in Washington, D.C. and is administered by NAVMTO.

The current terminal services contract is a five year firm fixed price contract. Contract lot one runs from 1 April 1990 to 31 March 1995. Competition for award of the five year contract acts to minimize government costs. Because the contract is for five years, terminal services are another element that keeps total QUICKTRANS system cost relatively fixed. This cost cannot be avoided. If the QUICKTRANS system is to continue, terminal services are needed.

In addition to the QUICKTRANS data base, government furnished equipment under the terminal services contract includes aircraft parking spaces, terminal buildings, and storage space.

b. Navy Expediting and Consolidation Program (NECP)

Within the QUICKTRANS Terminal Service Contract are provisions for the contractor to support NECP at Norfolk and Travis AFB. The purpose of NECP follows:

The Navy Expediting and Consolidation Program was established to provide expedited handling of Navy fleet support cargo generated by all government procurement offices worldwide and moving from CONUS vendors to ships and Naval overseas activities; to consolidate high priority Navy air cargo for movement overseas by AMC and commercial air; and to stuff SEAVANS on the west coast for ocean carriage. [Ref. 1: p. 5]

NECP services were not always included in the terminal contract. However, by including NECP activities in the contract, the contractor is able to use his work force more efficiently. Some economies of scale are achieved, saving contract cost when compared to separate solicitations for QUICKTRANS break-bulk operations and NECP activities.

4. Government Oversight

Government oversight of the QUICKTRANS system is delegated by NAVSUP to NAVMTO. NAVMTO will implement policies and develop operating procedures for the Navy Contract Cargo Airlift (QUICKTRANS) System and serve as the QUICKTRANS System Manager/Contract Representative [Ref. 16].

NAVMTO is the nerve center of QUICKTRANS. Cargo that is not allowed to free flow into the system must be cleared by NAVMTO. NAVMTO pays QUICKTRANS contract costs from the Navy Management Fund and bills shippers to reimburse the fund. It is NAVMTO that operates the QUICKTRANS data base. Most QUICKTRANS shipment tracking for QUICKTRANS customers is performed through the NAVMTO Challenge, Tracing, and Expediting Branch.

III. MATERIAL SHIPPED

The QUICKTRANS system developed to satisfy the Navy's high priority shipment needs. The type of material shipped in QUICKTRANS reflects the type of shipments required to sustain Navy readiness. This chapter examines QUICKTRANS shipment characteristics: number, weight, priority, QUICKTRANS component used for movement, freight classification, and type of material. Trends in the number and weight of QUICKTRANS shipments over the past six years are also presented.

A. SHIPMENT CATEGORIES

The data in this section is based on actual QUICKTRANS shipments. NAVMTO extracted four months of selected data on individual shipments from the QUICKTRANS data base for use as a sample. The sample was forwarded from NAVMTO to the Naval Postgraduate School for analysis. November 1991 and February, May, and August 1992 were the months included in the sample data base.

1. Shipments

The number of shipments per month ranged from a high of 44,796 shipments in February 1991 to a low of 40,935 shipments in May 1992. A total of 170,149 shipments were in the four month sample, an average of 42,537 shipments each month. Each shipment record contained ninety-seven card columns of data. Some of the more

important information for each shipment included weight, origin, destination, priority, and freight classification.²

2. Weight

Weight of individual shipments were totaled to determine the percentage of QUICKTRANS shipments falling into various weight categories. Results are graphically summarized in Figure 1. In general, the greater the weight the smaller the percentage of shipments moved through QUICKTRANS.

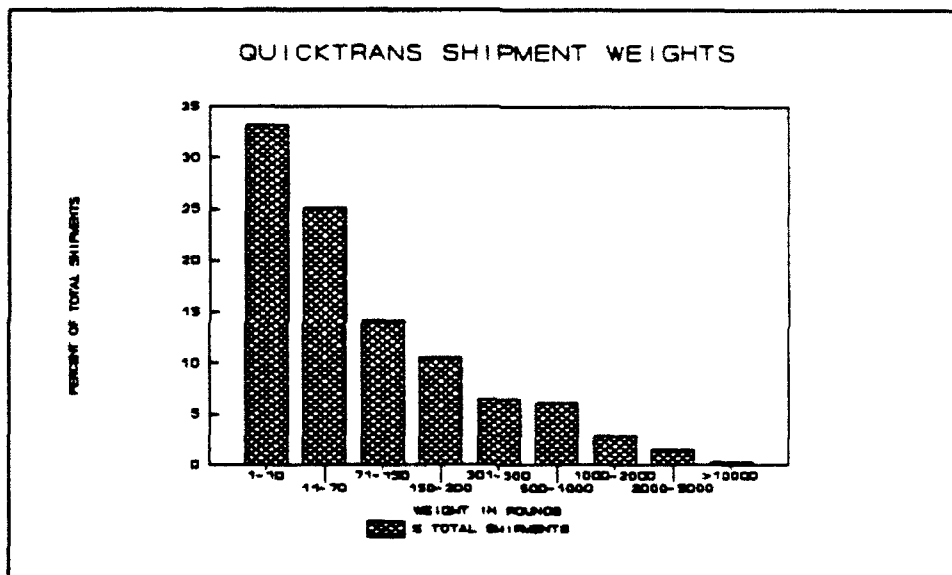


Figure 1: QUICKTRANS Shipment Weights

² Each shipment record contained the following information: 1) transportation control number (TCN), 2) number of pieces, 3) weight, 4) cube, 5) QUICKTRANS origin, 6) QUICKTRANS destination, 7) consignee unit identification code (UIC), 8) consignor UIC, 9) transportation priority (TP), 9) QUICKTRANS component, 10) date received, 11) date shipped, 12) point of entry, 13) point of delivery, 14) dimensions, 15) dimension code, 16) hazardous material, 17) security material, 18) refrigerated material, 19) air commodity and special handling code, 20) project code, and 21) required delivery date (RDD).

Small package services, such as United Parcel Service and the United States Postal Service, move packages weighing seventy pounds or less. There were a surprising number of these lightweight shipments. Fifty-eight percent of QUICKTRANS shipments weighed less than the seventy pound small package standard. One third of all QUICKTRANS shipments weighed ten pounds or less. In fact, ten percent of all shipments weighed only one pound! In terms of the number of shipments, QUICKTRANS is primarily a small package freight forwarder.

Shipments weighing seventy-one to five hundred pounds totaled thirty-one percent of all shipments. Finally, eleven percent of shipments exceeded five hundred pounds.

3. Priority

QUICKTRANS is designed to move high priority cargo. The priority of a particular shipment is defined by the Uniform Material Movement and Issue Priority System (UMMIPS). Based on the urgency of need and force activity designator, a material requisition is assigned a priority from one, for very urgent material, to fifteen, for routine material. Priorities are grouped into four transportation priorities (TPs) corresponding to the requisition priority for shipment: TP1 for priority 01-03 material, TP2 for priority 04-08 material, TP3 for priority 08-13 material, and TP4 for deferred freight. For TP1 and TP2 shipments, UMMIPS recommends air transportation [Ref. 7: p. 2-B-1]. QUICKTRANS shipments in the sample data base broken down by transportation priority as follows: TP1 47.8 percent, TP2 32.5 percent, TP3 19.1

percent, and TP4 0.5 percent. Thus, based on transportation priority, over eighty percent of all QUICKTRANS system shipments are eligible for air movement.

Recent funding declines in DOD transportation accounts have constrained expensive air transport. Services have tightened the number of shipments eligible for air movement to save dollars. For instance, in FY 91 NAVSUP amended Navy transportation policy. Eligibility for premium (usually air) transportation depended upon the type of requisition, project code, or required delivery date of the requisition [Ref. 17].

The type of requisition could not easily be determined from the sample data base except for extremely critical shipments degrading operational readiness which are assigned a "G" or "W" in the eleventh position of the transportation control number (TCN). All of these shipments would normally be eligible for air shipment. "G" and "W" requisitions totaled about twelve percent of all QUICKTRANS system shipments.³

There were over twenty-five hundred different project codes in the sample. Project codes exempt from air shipment challenge in QUICKTRANS are listed by NAVSUP [Ref. 18: encl. 2]. Assigning air transportation based on project codes shows approximately twenty-two percent of QUICKTRANS system shipments qualify for premium air transportation.⁴

³ Since TCN is a mandatory entry in the QUICKTRANS data base, the percentage of "G" and "W" high priority shipments was obtained from scanning all 170,149 shipments in the sample data base.

⁴ The project code is not a mandatory entry in the QUICKTRANS data base. Of 170,149 shipments, 68,850, or 40.46 percent, were missing the project code entry. Project codes exempt from air

Required delivery date (RDD) is the standard used by most DOD components to designate shipments eligible for air transportation. NAVSUP recognized 999, 777, N__, and E__ for possible air transportation in FY 91 [Ref. 17]. N__ and E__ RDDs occurred in only two tenths of one percent of total shipments. RDD 999 was cited in twenty four and one half percent and RDD 777 in twenty eight percent of QUICKTRANS shipments. By focusing on the RDD, a total of fifty-three percent of QUICKTRANS system shipments were air eligible.⁵

How material currently shipped in QUICKTRANS would be moved under alternative commercial alternatives has a direct impact on total cost. The greater the portion of QUICKTRANS shipments moved by commercial air, the greater the cost of alternative transportation. The percentage of QUICKTRANS shipments qualifying for air transportation based on transportation priority, requisition type, project code, and RDD is summarized in Table 1.

shipment totaled 21.01 percent of the reduced sample (21,912 divided by 104,299).

⁵ The required delivery date is not a mandatory entry in the QUICKTRANS data base. Of 170,149 shipments, 84,030, or 49.39 percent, were missing the RDD entry. RDDs eligible for air shipment totaled 52.72 percent of the reduced sample (45,406 divided by 86,119).

TABLE 1: PERCENTAGE QUICKTRANS SHIPMENTS AIR ELIGIBLE

	Sample Size	Air Eligible	Percent Air Eligible
Transportation Priority	170,146	136,735	80.36
Requisition Type	170,149	19,790	11.74
Project Code	104,299	29,912	28.68
Required Delivery Date	86,119	45,406	52.72

QUICKTRANS currently ships by air based on transportation priority. Any transportation system, including QUICKTRANS if contracts were changed to reflect fewer air movements, will save dollars if requisition type, project code, or RDD are used instead of transportation priority to designate air shipment eligibility. The smaller the percentage of shipments using air transport, the greater the savings. This dollar savings must be weighed against the increased pipeline for high priority shipments. Declines in readiness are the inevitable result of diverting high priority shipment to truck transportation.

4. QUICKTRANS Component

A category used to differentiate between QUICKTRANS system shipments is the QUICKTRANS component that moved the freight. The possible components are QUICKTRANS airlift, CONTRUCK, and NDTs. The category designation is important because CONTRUCK and NDTs truck shipments are billed at lower rates than the QUICKTRANS airlift shipments. The percent of total QUICKTRANS shipments in each component for the four sample months is shown below in Figure 2.

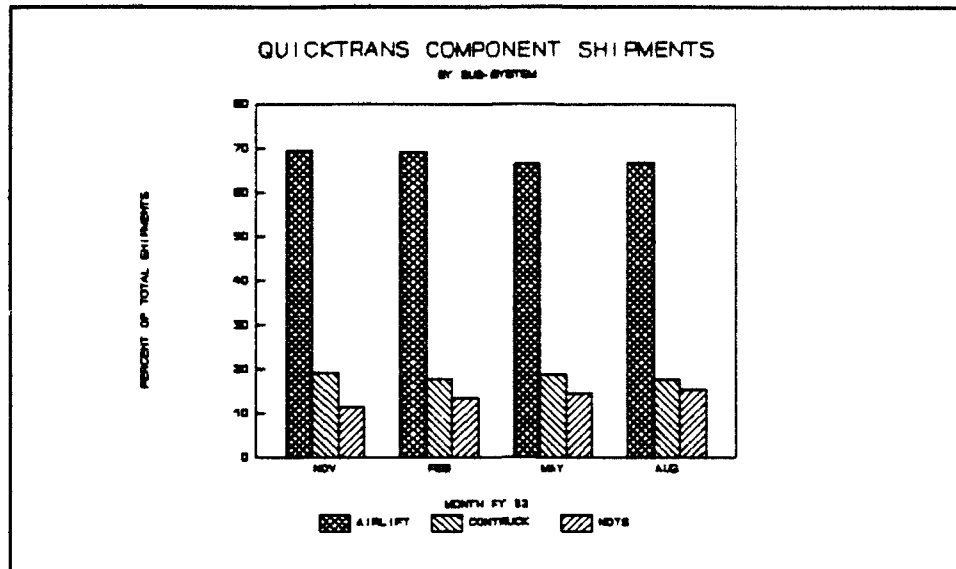


Figure 2: QUICKTRANS Shipment Components

For the four months of shipments analyzed, QUICKTRANS airlift, CONTRUCK, and NDTs shipments comprised 68.0, 18.3, and 13.8 percent of total QUICKTRANS shipments, respectively.

5. Freight Category

The QUICKTRANS data base identifies five different types of material freight categories. The first type is clean freight shipments which require no special handling. Special handling or dirty freight shipments make up the other four categories: outsized, hazardous, security, and temperature-controlled shipments.

Each category of dirty freight represents a distinctive competence of the QUICKTRANS system. The importance of dirty freight to the QUICKTRANS system can be illustrated by showing the dirty freight categories compared to clean freight in

three different measures: percent of shipments, percent of total weight, and percent of total revenue. Figure 3 is based on the sample data base.⁶

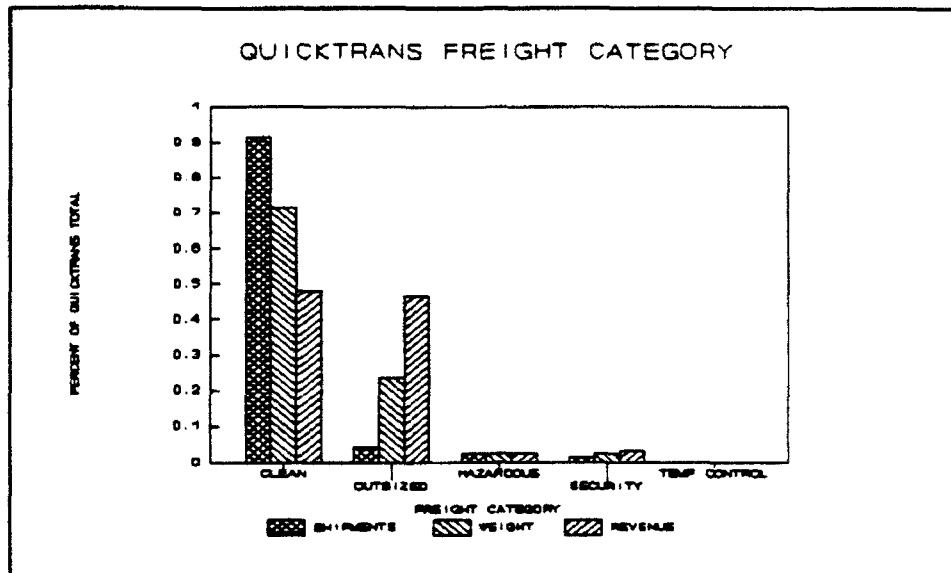


Figure 3: QUICKTRANS Freight Categories

Clean freight represents 91.5 percent of all shipments, 71.6 percent of total weight, and 47.9 percent of total revenue shipped in QUICKTRANS. Summing the dirty freight categories shows that over 50 percent of QUICKTRANS system revenue is generated by 8.5 percent of total shipments or 28.4 percent of total weight.

⁶ Shipments coded in more than one dirty freight category were excluded. In the 170,149 shipment sample data base, there were 515 shipments in this hybrid dirty freight category. Further, revenue shown includes QUICKTRANS bills from before and after a change in procedure which increases charges for dirty freight shipments. Therefore, dirty freight revenue as a percentage of total QUICKTRANS revenue is understated.

6. Type of Material

The QUICKTRANS data base does not contain a mandatory data block to specifically identify material by nomenclature, part number, or stock number. Broad groups of material are identified by freight category. A more detailed of the type of material shipped in QUICKTRANS is made by air commodity and special handling codes [Ref. 7: p. F-6] used to identify items being shipped and to highlight specific items which may require some type of special handling. This section looks at the type of material shipped in each freight category.

a. Clean Freight

Clean freight is freight that requires no special handling. This category includes freight of all kinds. By air commodity code, the following general types of clean material are shipped in QUICKTRANS:

1. Communications equipment and supplies (25.5%)
2. Aircraft equipment and supplies (23.5%)
3. Vehicles, machinery, and shop and warehouse equipment and supplies (12.6%)
4. Construction materials (12.1%)
5. Material received through the U.S. Mail (8.6%)
6. Unaccompanied baggage (2.6%)
7. Miscellaneous items including chemicals, forms and publications, clothing, medical supplies, ships parts, and inert arms, weapons, or component parts (15.1%)

Not all clean QUICKTRANS shipments would be classified as clean in the commercial sector. For example, small numbers of live animal shipments and human

remains shipments classified as clean under QUICKTRANS would require special handling with commercial carriers.

b. Outsized Freight

The DOD definition of outsized cargo (as specified by UMMIPS) is a shipment with any dimension greater than 72 inches [Ref. 7: p. A-11]. NAVMTO uses this DOD definition to identify QUICKTRANS outsized shipments.

It is important to realize the DOD outsized definition is unique. For QUICKTRANS contractor personnel, the working definition of outsized is any cargo that will not fit on a 463L aluminum air cargo pallet, which is 88 by 108 inches [Ref. 1: p. 33]. Each commercial air freight forwarder has a different definition of outsized shipments. Danzas Corporation has a separate rate category for shipments containing pieces in excess of 125 inches in length or 88 inches in width [Ref. 19]. Universal Transportation and Services also uses 125 inches by 88 inches to establish a new rate category for shipments [Ref. 20]. It's not a coincidence that a standard commercial aircraft pallet measures 125 inches by 88 inches.

The following is a summary, by air commodity code, of all outsized cargo shipped in QUICKTRANS:

1. Aircraft equipment and supplies (46.2%) including aircraft engines (6.16%)
2. Construction materials (28.8%)
3. Communications equipment and supplies (8.6%)
4. Vehicles, machinery, shop, and warehouse equipment and supplies (7.5%)
5. Ships parts (5.0%)

6. Miscellaneous items including unaccompanied baggage, office supplies and equipment, and inert arms, ammunition, explosives, or component parts (7.5%)

It is interesting to note that approximately one in every two hundred QUICKTRANS system shipments is an aircraft engine.

c. Hazardous Freight

Hazardous material has been identified by the Department of Transportation as regulated materials by virtue of the dangerous properties inherent in the nature of the material or its movement. QUICKTRANS conforms to Department of Transportation regulations for hazardous material shipment.

Air commodity codes show the following types of hazardous material shipped in QUICKTRANS:

1. Chemicals requiring special handling (41.0%)
2. Construction materials (16.0%)
3. Communications equipment and supplies (14.0%)
4. Explosives (11.9%)
5. Aircraft equipment and supplies (4.7%)
6. Fuels and lubricants (3.6%)
7. Miscellaneous items including ships parts, vehicles, machinery, shop and warehouse equipment and supplies, and photographic and office supplies (8.8%)

Since QUICKTRANS and all other commercial carriers must ship in accordance with Department of Transportation regulations, QUICKTRANS hazardous material shipments would be documented as hazardous or dangerous goods if shipped commercially.

d. Security Freight

Security freight is material which is classified, highly pilferable, or unusually valuable. Depending on the sensitivity of the shipment, one of the three different types of special handling is available in the QUICKTRANS system.

Protective Security Service (PS): a transportation protective service used for SECRET shipments which includes continuous attendance and surveillance of the shipment by qualified employees and the use a signature and tally record.

DOD Constant Surveillance Service (CS): a service requiring responsibility for constant surveillance and custody of shipments in transit. Uses the signature and tally record. Applies to confidential and sensitive arms, ammunition and explosive shipments.

Signature and Tally Record Service (ST): a service designed to provide continuous responsibility for the custody of DOD shipments in transit. It requires a signature and tally record from each person responsible for the proper handling of the shipment at specified stages of its transit from origin to destination [Ref. 21: pp. 22, 30, 35].

PS is only available on QUICKTRANS airlift routes while CS and ST services are offered on QUICKTRANS airlift, CONTRUCK, or NDTs.

Air commodity codes identify the following types of security freight shipped in QUICKTRANS:

1. Communications equipment and supplies (55.1%)
2. Aircraft equipment and supplies (14.7%)
3. Arms and weapons including component parts (14.0%)
4. Armed Forces Courier Service (AFRCOS) material (5.1%)
5. Ships parts (4.7%)
6. Miscellaneous items including publications, medical supplies, clothing, and photographic supplies and equipment (6.4%)

For security shipments, the special handling code should identify SECRET shipments. Only one shipment was so designated. The vast majority of QUICKTRANS security freight is moved under DOD Constant Surveillance Service (CS) or Signature and Tally Record (ST) procedures and are coded as protected cargo including sensitive, cargo requiring hand to hand receipt, and/or security precautions.

e. Temperature-Controlled Freight

Temperature-controlled freight must be moved within a prescribed temperature range. In QUICKTRANS, temperature-controlled movements account for only one in one thousand shipments. By air commodity codes, over ninety percent of temperature-controlled movements are for medical supplies. The special handling code shows that all temperature-controlled freight required refrigeration.

B. QUICKTRANS AIRLIFT TRENDS

Data used in this section was provided by NAVSUP and applies to QUICKTRANS airlift only.⁷ The data is presented here to underscore trends in air shipment statistics which adversely impact QUICKTRANS operations.

1. Airlift Total Weight Trend

QUICKTRANS airlift is designed to maximize available L-100-30 aircraft payload. Since QUICKTRANS airlift contract costs are largely fixed and customers reimburse contract costs, the larger the payload moved, the cheaper the average cost per pound to customers. Stated another way, more weight moved on any given QUICKTRANS airlift means lower shipping rates for all customers. Figure 4 shows total QUICKTRANS airlift shipment weight by month from FY 87 through FY 92. As can be seen, QUICKTRANS airlift shipment weight is declining over time. Simple regression analysis shows average yearly weight shipped dropping by 74,085 pounds a year with an R-squared value of .84. Total yearly weight shipped has fallen by 40 percent. Drops in the total amount of weight shipped reduce QUICKTRANS efficiency due to its fixed costs of operation.

⁷ Mr. Richard Hacks, NAVSUP Code 441B, provided the raw data for this section. The data was extracted by Mr. Hacks from the QUICKTRANS data base. It should be noted that a different computer system and software package compiled QUICKTRANS airlift statistics before FY 91. However, the data is still useful in trend analysis.

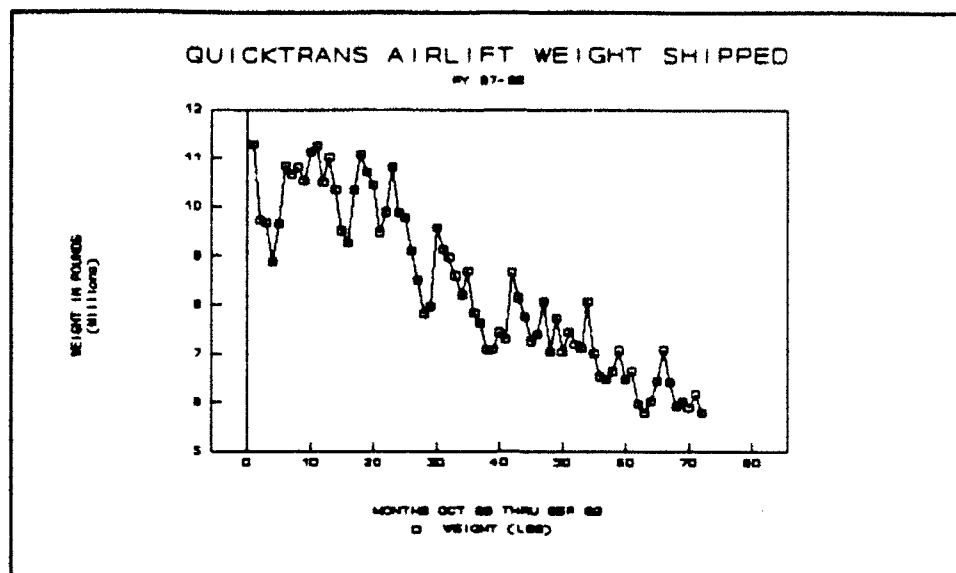


Figure 4: Monthly QUICKTRANS Airlift Weight Shipped

2. Airlift Total Shipment Trend

The trend in total QUICKTRANS airlift monthly shipments mirrors the overall downward trend seen in monthly weight totals. Total shipment figures from FY 87 through FY 92 appear below in Figure 5. The spike represents Desert Shield/Storm shipments. The consequence of fewer QUICKTRANS airlift shipments, like less weight being shipped, is reduced efficiency and higher average customer shipping cost.

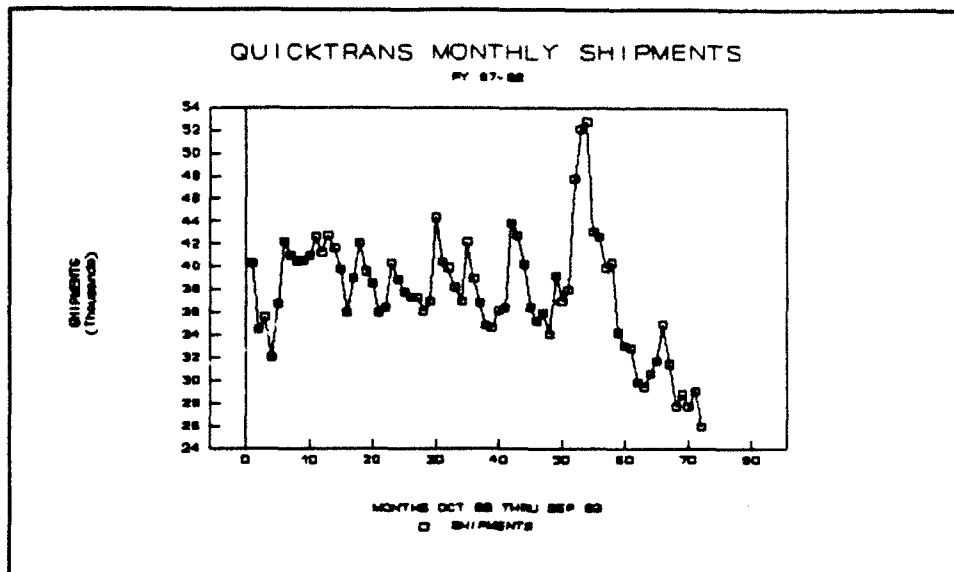


Figure 5: Monthly QUICKTRANS Airlift Shipments

3. QUICKTRANS Airlift Seasonality

Analysis of the QUICKTRANS airlift monthly shipment and weight statistics showed consistent seasonality. This seasonality can be seen by looking at monthly total shipping weight for FY 87 through FY 92 in Figure 6.

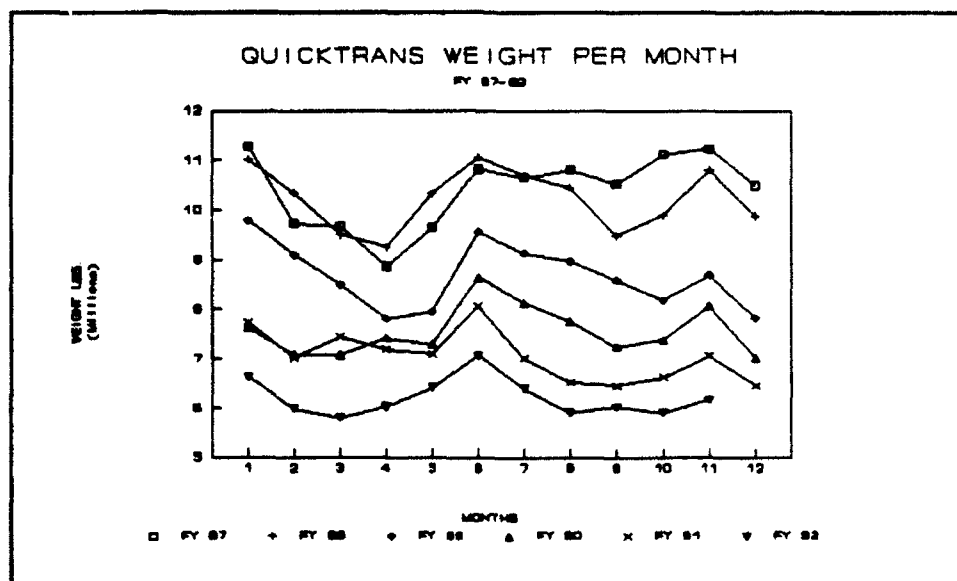


Figure 6: QUICKTRANS Airlift Seasonality

The four month sample data base received from NAVMTO corresponded to months 2, 5, 8, and 11 for FY 92 in Figure 6. If the sample reflected total FY 92 shipment weights accurately, the four months (one third of a year) should include one third of total FY 92 QUICKTRANS airlift weight shipped. A check of the sample data showed shipment weight of 33.03 percent of total FY 92 QUICKTRANS airlift weight shipped. Thus, despite seasonality, the sample data base represented one third of total FY 92 QUICKTRANS airlift weight shipped. It follows that results based on the sample data base can be multiplied by three to obtain FY 92 estimated totals.

IV. COST AND BILLING STRUCTURE

This chapter examines the cost of QUICKTRANS system operations. The total cost for the system is found by adding together the costs incurred in providing the segments of QUICKTRANS service. The Navy Management Fund is used to pay QUICKTRANS expenses.

The billing structure developed to recover QUICKTRANS costs from shippers is detailed. A brief discussion of the advantages and disadvantages of the billing structure is also presented.

A. QUICKTRANS COSTS

The QUICKTRANS system operates through a series of contracts administered by NAVMTO and tied together by the QUICKTRANS data system. The total costs for QUICKTRANS operation can be determined by adding the contract, data system, and some miscellaneous costs together. The specific segments which make up the total costs of the QUICKTRANS system follow:

1. QUICKTRANS airlift contract cost.
2. Cost for DOD fuel provided free of charge to the airlift contractor
3. Cost for transportation taxes. A 6.25 percent tax is required by the Department of Transportation on all domestic air shipping charges. All shipments arriving from or destined to foreign countries are exempt from this tax. This is a direct reimbursement to the contractor.
4. QUICKTRANS terminal services contract cost.

5. Reimbursement to the Air Force for terminal services at McCord AFB and Charleston AFB.
6. NECP portion of QUICKTRANS terminal services contract.
7. QUICKTRANS guaranteed traffic award (GTA) contract cost for trucking services.
8. QUICKTRANS data system cost for ADP services.
9. Miscellaneous costs for extra security guard services at NAS Norfolk.

The contract costs listed above are negotiated on a firm fixed price basis and are largely fixed costs. DOD fuel cost varies based on DOD jet fuel costs for each fiscal year. QUICKTRANS data system costs are computed by NAVMTO for system operation and overhead.

1. Fiscal Year 92 Total Cost

The total costs for QUICKTRANS operation in FY 92 is determined by summing the cost of each QUICKTRANS cost segment. The cost for each segment and the total are shown in Table 2 [Ref. 21]. Total QUICKTRANS system costs for FY 92 were \$47,242,905. This amount was billed by NAVMTO to QUICKTRANS shippers to cover system operation.

TABLE 2: QUICKTRANS SYSTEM FY 92 TOTAL COST

QUICKTRANS Airlift Contract	\$20,454,546
DOD Fuel Provided Airlift Contractor	\$ 4,689,239
Transportation Taxes	\$ 1,152,364
QUICKTRANS Terminal Services Contract	\$11,758,413
Other Air Force Terminal Services	\$ 234,090
NECP Portion of Terminal Services Contract	\$ 2,515,099
QUICKTRANS Trucking Service GTA Contracts	\$ 5,391,520
QUICKTRANS Data System Cost	\$ 1,017,634
Miscellaneous Cost	\$ 30,000
Total QUICKTRANS FY 92 Costs	\$47,242,905

2. Navy Management Fund

QUICKTRANS operations are financed through the Navy Management Fund. „

NAVSUP is responsible for overall management of the fund. Specifics on Navy Management Fund policies are:

The Navy Management Fund is utilized for payment of operating expenses and for recoupment of costs from QUICKTRANS users. Recoupment is based upon pound rates established by NAVSUP and computed by NAVMTO.

NAVMTO will develop and submit the rate computation formula and methodology to NAVSUP (SUP 05) for approval.

Using the approved rate computation methodology, NAVMTO will compute monthly the transportation rate required to reimburse the Navy Management Fund by QUICKTRANS users. [Ref 12: p. 2,3]

The fund operates as a revolving fund, fronting payments for QUICKTRANS operations and being reimbursed by user shipping fees.

Notice that the shipping fee for individual shipments can not be determined until all shipments for a particular month have been completed. Only then can NAVMTO compute the transportation rate that will reimburse the Navy Management Fund for QUICKTRANS expenses. The rate is then applied to individual shipments to determine the user shipping fee. Consequently, QUICKTRANS shippers do not know exactly what a shipment will cost until the month after a shipment movement has been completed.

B. QUICKTRANS BILLING STRUCTURE

NAVMTO uses a break even philosophy when developing the QUICKTRANS billing structure. The structure is designed to recover all QUICKTRANS costs paid by the Navy Management Fund from QUICKTRANS users, no more and no less. 5

The unit of measure used to charge QUICKTRANS shipping fees is the pound mile. A pound mile is simply one pound shipped one mile. To determine a shipment's pound miles, weight in pounds is multiplied by distance in miles. For instance, a 100 pound shipment moving 50 miles represents 5,000 pound miles (100 times 50 = 5,000).

Up to April 1992, shippers were billed at a rate per pound mile that reimbursed NAVMTO for the QUICKTRANS airlift, CONTRUCK, and NDTs costs regardless of the type of shipment made or the distance the shipment moved [Ref. 22]. By treating all shipments equally, the QUICKTRANS billing structure effectively subsidized the added cost incurred to move dirty freight requiring special handling at the expense of those who shipped clean freight shipments. When DLA began to assume the NSCs

position as shippers of wholesale stock, managers noted that high priority shipments could be moved cheaper via commercial air freight forwarders. Consequently, DLA began diverting shipments to other carriers.

NAVMTO reacted by changing its billing structure for QUICKTRANS airlift, CONTRUCK, and NDTs shipments [Ref. 23]. The revised rate structure charges a base rate for clean freight. Hazardous, security, and temperature-controlled shipments are charged two times the base rate. Outsized shipments are charged five times the base rate. All shipments are then given a rate break if the distance shipped is over one thousand miles.

The modified QUICKTRANS billing structure closely mirrors rates in the commercial air freight industry. Shipments needing special handling cost more to ship, and rates per pound fall as distance increases.

1. QUICKTRANS Billing Formula

The billing structure for QUICKTRANS airlift shipments can be reduced to the formula in Table 3. All calculations are performed by QUICKTRANS data system software.

TABLE 3: QUICKTRANS AIRLIFT BILLING FORMULA

1. Determine pound miles for each shipment: Shipment pound miles = (weight x miles)(rate factor)(mileage factor)

Where: weight = shipment weight in pounds

miles = distance in statute miles

rate factor = 1 for clean freight

2 for hazardous, temperature-controlled, security freight

5 for outsized freight

mileage factor = 1 for 1 to 1,000 miles

.9 for 1,001 to 1,500 miles

.8 for 1,501 to 2,250 miles

.6 for 2,251 to 2,700 miles

.5 for over 2,700 miles

2. Total shipment pound miles to obtain total shipment pound miles for the month.

3. Determine monthly costs for QUICKTRANS airlift contract including transportation taxes and aircraft fuel. Add prorated portion of GTA trucking contracts, QUICKTRANS data system, and terminal services contract costs (less NECP charges).

4. Divide applicable QUICKTRANS costs for month by total monthly pound miles to get cost per pound mile.

5. Multiply cost per pound mile by individual pound miles per shipment to obtain individual shipping fee.

6. If individual shipping fee is less than \$15, apply \$15 minimum QUICKTRANS shipping fee.

7. Repeat steps 1 through 6 with \$15 minimum shipping fee included (\$15 minimum increases revenue where total monthly QUICKTRANS shipping fees are slightly above monthly QUICKTRANS airlift total cost).

8. Repeat steps 1 through 7 until total QUICKTRANS revenue generated through shipping fees = total QUICKTRANS airlift costs.

9. Sum total shipping fees for each agency responsible for paying for shipment transport by Transportation Account Code (TAC) and submit single itemized bill for QUICKTRANS airlift, CONTRUCK, NDTs, and/or NECP service for payment.

For billing purposes, QUICKTRANS airlift shipments include shipments that move exclusively by NDTs or CONTRUCK if the material is TP1 or TP2 material. TP1 and TP2 shipments are counted as CONTRUCK or NDTs shipments only if the shipping document is annotated "NDTS" or "CONTRUCK" to take advantage of lower shipping rates. Most TP3 and TP4 shipments move via CONTRUCK and NDTs, and are billed accordingly.

2. CONTRUCK and NDTs Billing Procedure

Similar calculations are performed to determine the shipping fees for NDTs and CONTRUCK shipments. NDTs and CONTRUCK monthly costs exclude all QUICKTRANS airlift contract and DOD jet fuel costs. Therefore, NDTs and CONTRUCK shipments are considerably cheaper than QUICKTRANS airlift shipments.

3. Navy Expediting and Consolidation Program (NECP) Billing Procedure

Navy Expediting and Consolidation Program services are dependent on the cost of each type of service and billed separately. Charges for processing for NECP services are approximately \$.05 a pound for vendor originated freight, approximately \$7.00 a measurement ton for SEAVAN stuffing of cargo destined for overseas carriage, and approximately .11 cents a pound for Navy consolidation (NAVCON) of shipments going overseas via AMC [Ref. 13: p. 12]. "Approximately" is the operative word, because actual charges depend on the weight of monthly vendor cargo processed, measurement tons stuffed in SEAVANS, and pounds of material consolidated on AMC pallets just as shipment fees depend on the total pound miles shipped in a month.

4. Advantages of the QUICKTRANS System Billing Structure

The QUICKTRANS system billing structure has several strengths:

1. Navy Management Fund QUICKTRANS system outlays are matched exactly to QUICKTRANS system revenues.
2. A shipping document is all that is needed to initiate billing. No commercial bill of lading (CBL) or government bill of lading (GBL) is produced by the shipping activity or processed for payment by NAVMTO.
3. All computations necessary for accessing shipment fees are completely automated by the QUICKTRANS data system.

The procedures required by shippers to move commercial shipments by completing a CBL or GBL contrast sharply with QUICKTRANS procedures. The primary document used for QUICKTRANS movement is the Transportation Control and Movement Document (TCMD), DD Form 1384, but the DD Form 1348-1, Issue Release/Receipt Document (IRRD), DD-1149, or similar document is also accepted [Ref. 13: p. 2]. QUICKTRANS documentation procedures may save significant administrative costs associated with CBL and GBL preparation and processing. Specific cost savings are estimated in Chapter VI.

5. Disadvantages of the QUICKTRANS System Billing Structure

The disadvantages of the QUICKTRANS system billing structure are as follows:

1. By matching QUICKTRANS system outlays exactly with system revenues, charges for individual shipments are not known by shippers in advance.
2. Shipping fees can be estimated based on historical data, but exact fees are unknown making a published rate tender based on shipment type, weight, and distance impossible.

QUICKTRANS is a commercial transportation system operating in a competitive market. Customers, especially non-Navy customers like DLA, have little incentive to use QUICKTRANS unless rates for service can be guaranteed. Further, QUICKTRANS and commercial rates cannot be accurately compared by shippers unless NAVMTO promulgates the equivalent of a QUICKTRANS tender. How do shippers know QUICKTRANS is a good deal? Unless rates are published, erosion of the QUICKTRANS customer base will continue, driving rates up for the remaining QUICKTRANS shippers.

V. ALTERNATIVE COMMERCIAL TRANSPORT OF QUICKTRANS SHIPMENTS

This chapter develops a model to estimate the cost of shipping material currently moved in the QUICKTRANS system by readily available alternative commercial transportation. Previous cost studies of QUICKTRANS and LOGAIR are briefly examined. Assumptions necessary for making a cost comparison are discussed. The logic behind the selection of the alternative commercial carriers used in the model is addressed.

For developing the cost model, QUICKTRANS shipments are divided into buckets. Shipments in each bucket are run against computer programs designed to estimate alternative commercial transportation costs. The cost of each QUICKTRANS shipment bucket is then totalled to estimate the cost of moving QUICKTRANS shipments under four different scenarios with varying criteria for what constitutes an eligible air shipment.

A. PREVIOUS QUICKTRANS AND LOGAIR COST STUDIES

The possibility of replacing the QUICKTRANS system with alternative commercial carriers has been frequently studied. Holden and Weber studied the feasibility of replacing QUICKTRANS with an Emery Air Freight proposed alternative system in 1983 [Ref. 4]. They concluded that Emery could provide service comparable to QUICKTRANS system service at a lower cost. McBurney examined Holden and

Weber's data in 1986. He concluded that QUICKTRANS was preferred to the Emery proposal due to the uncertainty of costs and services claimed by Emery [Ref. 5: p. 58]. Both studies focused on having a single commercial carrier assume QUICKTRANS services.

A study by the Logistics Management Institute in 1981 took a one percent sample of QUICKTRANS shipments from January to June 1980 and evaluated moving the cargo by alternative commercial air and commercial truck carriers. The study concluded that QUICKTRANS was efficiently operated. The cost of moving TP1 and TP2 via commercial air was found to be about the same as QUICKTRANS system movements [Ref. 25: p.8].

It is a study of LOGAIR costs when compared to commercial alternative costs that has had the greatest impact on recent QUICKTRANS cost analysis. In May 1992, the Air Force Logistics Management Agency (AFLMA) estimated costs for moving that portion of LOGAIR shipments which were eligible for movement via readily available commercial means. The AFLMA study looked at several different alternatives which moved dirty freight by air or surface shipment with varying criteria for determining air transport eligibility. Moving dirty freight shipments by commercial contracted airlift while moving clean shipments by commercial air (Federal Express) was the alternative recommended by AFLMA for adoption by the Air Force.

The Tiger Team therefore opted to recommend a mixture of commercial movement for most cargo (at our estimated cost of 39 million dollars) and contracted airlift for movement of oversized/hazardous cargo at an estimated annual cost of 37 million dollars. HQ USAF/LGT estimated the infrastructure costs to support a mixed system at 6 million dollars. The total estimated cost of the alternative to the

existing LOGAIR system was 82 million dollars, or approximately 34 million dollars less than the 116 million dollars HQ AFLC reported for the current LOGAIR system. [Ref. 26: p. i]

The Air Force accepted the proposal for movement of clean LOGAIR freight by commercial air carriers. For dirty freight, an alternative to divert all shipments to routine truck transport was selected over the contracted airlift AFLMA alternative with an additional savings of \$4.1 million. The Air Force announced LOGAIR operations would be terminated on 30 September 1992 [Ref. 27].

B. COST MODEL ASSUMPTIONS

QUICKTRANS system and alternative commercial carrier service characteristics are not identical. Several assumptions are necessary in order to make a comparison of the QUICKTRANS system with other commercial carriers. Assumptions made in developing the cost model follow:

1. The four month sample provided by NAVMTO from the QUICKTRANS data base accurately describes QUICKTRANS shipments.
2. QUICKTRANS airlift shipment transit times are similar to commercial air carrier transit times.⁸
3. CONTRUCK and NDTs shipment transit times are similar to commercial truck less-than-load transit times.⁹

⁸ Transit time for TP1 shipments is approximately 55 hours [Ref. 12: p.4]. For purposes of comparison, the 55 hour standard most closely approximates commercial air transportation second day air rates.

⁹ Transit time for NDTs and CONTRUCK shipments is approximately 2.2 days and 5.5 days, respectively [Ref. 12: pp. 6,8]. Shipping times allowed for LTL truck shipments in the Consolidated Freight Management System averaged about 3 days longer on NDTs routes and up to 6 days longer on CONTRUCK routes.

4. With the exception of outsized freight, no dimensional or volumetric weight charges were allowed for commercial shipping cost. (Most commercial carriers reserve the right to levy additional charges based on volumetric standards.)
5. QUICKTRANS system services and commercial carrier system services are essentially identical. In fact, QUICKTRANS is a point to point service while most carrier rates are for door to door service.
6. All outsized and hazardous air material shipments become clean shipments when transferred to truck transportation.
7. Hazardous material shipped by QUICKTRANS airlift could be shipped by alternative commercial air carrier.
8. Consolidation of shipments was only allowed for LTL truck shipments with the same consignor unit identification code and consignee unit identification code received on the same day by QUICKTRANS for shipment.

The assumptions listed above treat most shipments within freight categories as identical. However, QUICKTRANS shipments form a diverse and rich data set. Although many shipments in the data base required unique handling (e.g., security courier shipments and SECRET shipments), all shipments within a QUICKTRANS shipment bucket were treated the same. Treating all shipments within a bucket identically masks individual shipment characteristics which may result in shipping charges much greater than those charges applied to a particular freight category. Treating all shipments the same is a weakness of any cost model which aggregates shipments.

C. SELECTION OF ALTERNATIVE COMMERCIAL CARRIERS

Alternative commercial carriers were selected to replace QUICKTRANS service based on type of freight shipped, cost, and service characteristics.

1. Air Carriers

Small package air express companies were examined to determine a carrier capable of delivering clean shipments weighing up to 150 pounds. Several companies met this criterion. However, Federal Express GSA contract rates [Ref. 28] for government freight were clearly less than rates charged by other alternative carriers.

Federal Express service characteristics are slightly superior to QUICKTRANS service. In particular, shipment visibility, using the Federal Express COSMOS tracking system and guaranteed shipment delivery by 3 P.M. the next business day, exceed comparable QUICKTRANS service characteristics.

An air carrier was also needed to move clean freight over 150 pounds in order to estimate movement of heavy (not outsized) shipments. The lowest cost carrier appeared to be Federal Express. However, the rates for moving heavy shipments through Federal Express are qualified by "any additional charges incurred by Federal Express such as equipment rental and setup will be billed to payor of shipment" [Ref. 29]. Further, Federal Express did not have scheduled heavy shipment service to several QUICKTRANS points.¹⁰

After consulting with MTMC Western Area, Danzas Corporation and Universal Transportation and Services were considered for moving heavy and outsized

¹⁰ Over 17 percent of QUICKTRANS origin and destination points were not listed in the 1990 Federal Express Worldwide Service Guide as heavyweight service areas. These points included 16.6 percent of all QUICKTRANS system sample shipments. Unspecified additional charges would be levied by Federal Express for these shipments.

shipments. Their government tender rates were very close to Federal Express rates. Danzas Corporation was chosen as the most cost effective heavy clean freight carrier [Ref. 29].

Danzas Corporation was also chosen to estimate alternative commercial cost of outsized dirty freight air shipments. For outsized shipments, dimensionalized or volumetric shipment charges were allowed. Danzas Corporation's tender charged the greater of 4,500 pounds or actual shipment weight for each pallet required for outsized shipment movement.

Each air freight tender had slightly different provisions for shipping outsized material via air. Because outsized shipment charges are an important category of QUICKTRANS airlift freight, the effect of several different air carrier tender rates are analyzed in Chapter VI of this thesis.

Hazardous shipments were considered to be transportable on commercial air carriers for a minimum additional charge. For instance, Federal Express charged an additional five dollars for each hazardous or dangerous goods shipment. Basic shipping charges were applied to hazardous shipments as though they were clean shipments. Charges were based on weight using Federal Express charges for weights equal or less than 150 pounds, and using Danzas charges per hundred pounds shipped for heavier shipments. A five dollar charge was then added to the cost of each hazardous material shipment.

All temperature-controlled shipments required refrigeration. Federal Express treats these shipments much like hazardous shipments. Since there were only 158

refrigerated shipments, they were combined with the hazardous shipments. A five dollar service charge was levied for each shipment in addition to the normal Federal Express or Danzas shipment charges.

Security shipments are very expensive to ship by commercial air. An Emery Worldwide tender was selected to estimate the cost of moving QUICKTRANS airlift security shipments by default. Currently, only Emery Worldwide is cleared to move security shipments by air and they offer Constant Surveillance Service (CS) and Signature Tally Record Service (ST) [Ref. 31].

It is possible that the government could face a situation where no major air carrier is qualified to move security shipments. Federal Express has been stripped of its certification to move security shipments for only a fifteen dollar charge.

For an extra \$15 a package, some 200,000 shipments of non-lethal military parts and confidential documents were moved in specially labeled constant surveillance packages and were supposed to be kept in a locked container that would always be in the line of sight of the driver. But the government said the only thing special about the "constant surveillance service" was the higher cost and Federal this month paid \$950,000 to settle a False Claims Act law suit over the service. [Ref. 32]

QUICKTRANS offers the only viable air freight competition to Emery Worldwide for movement of DOD security shipments in CONUS.

2. Truck Carriers

Estimating the cost of moving QUICKTRANS clean shipments by truck was difficult. No single commercial truck tender could be used to estimate QUICKTRANS shipment costs. Tenders and GTAs are very route specific. As a result, a company such as Consolidated Freight has over sixteen hundred tenders on file with MTMC.

Previous studies usually get around the problem of applying specific tender rates for truck shipments by using average rates. For instance, the AFLMA LOGAIR study used a rate of \$14.86 a hundredweight rate provided by MTMC with a two hundred pound minimum for estimating LOGAIR shipments to be moved by truck [Ref. 26: p. 10]. This method assumes LOGAIR shipments are "average". This thesis tries a different approach to estimate QUICKTRANS shipment trucking cost.

Most QUICKTRANS truck shipments are less-than-load (LTL) shipments. To estimate the cost of these shipments, fifty sample QUICKTRANS shipments were submitted to MTMC's Consolidated Freight Management (CFM) system.¹¹ The CFM system is the actual procedure used by traffic managers to determine the carrier and rate applicable to LTL shipments. The resulting rate quotes were then divided by the MTMC baseline class 100 rate [Ref. 33] to determine the percent of the class 100 rate schedule used by the second lowest cost LTL carrier.¹² LTL class 100 rates were then used to estimate initial LTL trucking costs between QUICKTRANS shipping points.

The survey indicated that NDTs shipments averaged about 47 percent of the class 100 rate. CFM rates for CONTRUCK and QUICKTRANS shipment routes averaged 39 percent of the class 100 rate. Initial LTL cost results were multiplied by

¹¹ A CFM remote terminal at NAS Lemoore was used to submit sample QUICKTRANS truck shipments to MTMC for processing rate quotes on 6 and 7 November 1992.

¹² The class 100 baseline rates have been constructed by MTMC. Carriers are encouraged to use the class 100 baseline rates and submit tenders to MTMC which specify shipping charges as a percentage of the class 100 rate.

47 percent for NDTs shipments and 39 percent for CONTRUCK and QUICKTRANS airlift shipments to obtain the estimated LTL trucking cost.

The class 100 rate differs according to distance shipped. Since the sample data base did not contain mileage, the mileage between major QUICKTRANS points was added to the program. Mileage to and from QUICKTRANS points close to the selected major QUICKTRANS points was assumed to be the same as distances between the major points.¹³ Analysis of the sample data base indicated over 79.2 percent of all QUICKTRANS shipments originated at these points and over 75.7 percent of all QUICKTRANS shipments were destined for these points.

Consolidation of shipments was allowed if the shipment originated and terminated from the same QUICKTRANS points and were received for shipment on the same day.

The class 100 rate structure described above was used to determine clean, outsized, and hazardous material LTL trucking costs. No additional charges were added to move these shipments by truck.

LTL truck and QUICKTRANS truck service characteristics are not identical. In particular, QUICKTRANS truck shipments have better visibility while being shipped and are easier for the shipper to trace. In addition, QUICKTRANS truck shipment times are faster than typical LTL shipping times.

¹³ QUICKTRANS origins and destinations used for truck mileage were Travis AFB, CA; NSC Pudget Sound, WA; NAS North Island, CA; Indianapolis, IN; NAS Pensacola, FL; NAS Jacksonville, FL; NAS Key West, FL; Patrick AFB, FL; Charleston AFB, SC; NAS Norfolk, VA; NSY Philadelphia, PA; Staten Island, NY; and NETC Newport, RI.

Security truck shipments did not use the class 100 rate structure. After consulting MTMC Western Area Special Commodities Branch and examining tenders for security and ammunition shipments, the following logic was used to estimate security shipment costs by truck:

1. Security shipments were assumed to require 70 percent Constant Surveillance Service (CS) and 30 percent Signature and Tally Record Service (ST).¹⁴
2. Cost for ST service was \$25 per shipment in addition to all other charges.
3. ST service shipments could move via LTL commercial truck for LTL class 100 rates plus the \$25 ST charge.
4. All CS shipments were charged .12 a mile for CS service, .22 a mile for dual driver protective (DN) service, a base security rate per hundred pounds shipped that increases with distance, and the \$25 ST charge in addition to base rates per hundred weight.
5. The minimum weight for CS shipment was 2,500 pounds.

All security shipments were treated as ST shipments moving by LTL truck at class 100 rates with results multiplied by 30 percent. The security shipments were then all treated as CS shipments with results multiplied by 70 percent. The ST and CS outcomes were added to obtain the total estimated cost of trucking security shipments.

D. THE COST MODEL

The cost model used in this thesis simulates shipment of QUICKTRANS material by commercial transportation. Seven steps are required:

¹⁴ This figure was estimated by Mr. Hamid Zarrabi, the Terminal Services Manager at Travis AFB on 20 November 1992. A small sample of 10 security shipments originating at Travis AFB selected by the author also indicated 70 percent of shipments were CS and 30 percent were ST shipments.

1. Select a scenario for determining how sample shipments will be moved: by air or truck shipment.
2. Divide QUICKTRANS shipments into buckets which will move by the same commercial transportation alternative.
3. Program commercial carrier tender or other structure rates in SAS language.¹⁵
4. Select appropriate SAS program commercial alternative shipping rates to apply to buckets of material.
5. Run SAS program rates against QUICKTRANS bucket to obtain the estimated commercial cost for transport.
6. Total the SAS program cost of all QUICKTRANS buckets to obtain the estimated total cost of replacing the QUICKTRANS system with a combination of commercial air and surface carriers.
7. Repeat steps one through five for each selected scenario used to determine air shipment eligibility.

The first six steps used in the cost model will be discussed in turn.

1. Alternative Scenarios

As discussed in Chapter III, determining if a QUICKTRANS shipment would be classified as air eligible depends on the criteria used to ascertain air shipment eligibility. Four alternatives were selected as probable scenarios for determining air shipment eligibility:

1. Use UMMIPS scenario designating QUICKTRANS airlift TP1 and TP2 shipments for air transportation (QUICKTRANS alternative).
2. Use constrained UMMIPS scenario designating all TP1 shipments for air transportation (TP1 alternative).

¹⁵ The SAS System is an integrated system of software providing complete control over data access, management, analysis, and presentation. SAS is a registered trademark used to identify products or services of the SAS Institute Inc.

3. Use required delivery date scenario designating 999, 777, 555, N__, and E__ RDD shipments for air transportation (DLA alternative).
4. Use required delivery date scenario designating 999, 777, 555, N__, and E__ clean shipments for air transportation while all dirty freight shipments are diverted to truck transport (Air Force alternative).

2. Shipment Buckets

Buckets of QUICKTRANS shipments vary depending on the scenario for determining air shipment eligibility and the type of material. Table 4 shows QUICKTRANS buckets based on the QUICKTRANS alternative which classifies QUICKTRANS airlift TP1 and TP2 shipments as air eligible. CONTRUCK and NDTs TP1 and TP2 shipments move by truck in the QUICKTRANS alternative. This was done so the total cost of the QUICKTRANS alternative would closely mirror current QUICKTRANS system air and truck movement costs.

TABLE 4: QUICKTRANS ALTERNATIVE BUCKETS

	QUICKTRAN S TP1/2 Air	QUICKTRAN S TP3 & TP4	CONTRUCK TP1-TP4	NDTS TP1-TP4
Clean < = 150 lbs.	78,483	1,636	18,165	17,984
Clean > 150 lbs.	23,104	1,027	10,183	4,547
Outsized	5,494	126	1,559	196
Hazardous	2,309	138	1,002	625
Security	2,772	51	153	75
Hybrid Dirty	465	23	20	9
Total Shipments	112,627	3,001	31,082	23,436

The shaded portion of Table 4 shows shipments to be moved by air. Unshaded buckets are moved by truck. In Table 4 and all subsequent tables in this thesis, the few refrigerated temperature-controlled shipments are included in hazardous freight bucket. The hybrid dirty category was added to capture the 517 shipments in the sample with more than one shipment characteristic, an outsized security shipment for example. The number of shipments in the QUICKTRANS alternative sample data base included 170,146 of the 170,149 shipments in the total four month sample data base.

The TP1 alternative designated all QUICKTRANS airlift, CONTRUCK, and NDTs TP1 shipments for air movement. Using the TP1 priority designation to calculate which shipments go by air resulted in the buckets shown in Table 5.

TABLE 5: TP1 ALTERNATIVE BUCKETS

	ALL TP1 Air	QUICKTRANS TP2-TP4	CONTRUCK TP2-TP4	NDTS TP2-TP4
Clean <= 150 lbs.	54,988	28,870	16,060	16,351
Clean > 150 lbs.	18,343	8,283	9,023	3,213
Outsized	4,380	1,654	1,212	129
Hazardous	1,795	1,345	850	535
Security	1,571	848	133	48
Hybrid Dirty	297	200	14	6
Total Shipments	81,372	41,200	27,292	20,282

Shaded buckets indicate air shipments. A total of 170,146 shipments in the total sample data base of 170,149 shipments are used to calculate the TP1 alternative transportation cost.

Using RDDs E__, N__, 555, 777, and 999 to designate air shipments resulted in a much smaller number of buckets. The DLA alternative buckets are shown in Table 6.

TABLE 6: DLA ALTERNATIVE BUCKETS

	RDD N__, E__, 555, 777, 999 Air	RDD Other Than N__, E__, 555, 777, 999 Truck
Clean <= 150 lbs.	34,411	23,673
Clean > 150 lbs.	7,299	12,138
Outsized	1,981	2,077
Hazardous	919	1,623
Security	726	847
Hybrid Dirty	84	338
Total Shipments	45,420	40,696

The shaded buckets in Table 6 indicate air shipment and unshaded shipments move by truck. Only 86,116 of 170,149 total sample data base shipments were included in the DLA alternative.

The alternative selected by the Air Force for replacement of LOGAIR resulted in shipment buckets as shown in Table 7. Note that all dirty freight shipments regardless of RDD are moved to truck transportation.

TABLE 7: AIR FORCE ALTERNATIVE BUCKETS

	Clean RDD N__, E__, 555, 777, 999 Air	Not RDD N__, E__, 555, 777, 999 and All Dirty Truck
Clean <= 150 lbs.	34,411	23,673
Clean > 150 lbs.	7,299	12,138
Outsized	0	4,058
Hazardous	0	2,542
Security	0	1,573
Hybrid Dirty	0	422
Total Shipments	41,710	44,406

As with the DLA alternative, only 86,119 of 170,149 sample data base shipments were selected for evaluating the cost of the Air Force alternative. Consequently, the smaller sample size requires a larger multiple estimate total FY 92 shipments. A multiple of approximately 5.93 is needed to estimate total FY shipments for the DLA and Air Force shipment buckets vice the multiply of 3 required for the larger QUICKTRANS and TP1 alternative shipment buckets.

3. SAS Programs

The SAS system was used to program alternative commercial carrier tender rates and other rate structures. A total of seven programs were written to evaluate alternative commercial shipment cost for QUICKTRANS shipments. The programs developed were:

1. Federal Express SAS for Federal Express GSA contract rates applied to air shipments up to one hundred and fifty pounds.

2. Danzas SAS for Danzas Corporation Tender Five rates applied to air shipments over one hundred and fifty pounds. Second day rates were chosen over higher rates for faster service since QUICKTRANS airlift shipment times of about 55 hours are similar to second day service delivery times.
3. Danzas Outsized SAS for Danzas Corporation Tender Five rates applied to air outsized shipments. Once again second day rates were used.
4. Emery SAS for Emery Worldwide Tender Two rates applied to air security shipments.
5. LTL Truck SAS for MTMC class 100 rate schedule rates applied to all truck shipments with the exception of security shipments.
6. LTL Truck Security SAS for MTMC LTL trucking rates applied to security truck shipments.

Copies of the six SAS programs are provided in Appendix D.

Rate breaks for shipment of phantom freight, when paying for the excess weight resulted in lower overall shipment costs, were computed in the Danzas and Emery programs. For instance, if a shipment weighed 950 pounds and shipments between 500 and 999 pounds were charged \$50 for every 100 pounds, the total cost of the shipment would be \$475 (\$50 times 950 pounds). Given a weight break for shipments equal to or over 1000 pounds that lowers charges to \$45 for every 100 pound shipped, the total cost of the shipment would be \$450 (\$45 times 1000 pounds). By paying for the shipment of 50 pounds of phantom freight, total shipment charges are reduced from \$475 to \$450, a savings of \$25 dollars.

Shipment consolidation was formulated in the LTL truck and LTL truck security program. If shipments originating on the same date from identical consignor

unit identification codes were destined for the same consignee unit identification code, the shipments were consolidated.

4. SAS Program Application to QUICKTRANS Shipment Buckets

The appropriate SAS program was selected for each bucket of QUICKTRANS shipments. For example, a bucket of shipments weighing not more than one hundred and fifty pounds moving by air would require the Federal Express SAS program. All other buckets are similarly evaluated and the needed SAS program for evaluation of QUICKTRANS shipment bucket costs selected.

5. Running SAS Program Against QUICKTRANS Buckets

Each SAS program accessed the entire QUICKTRANS sample data base. The program selected shipments from the entire 170,149 shipment data base depending on QUICKTRANS shipment bucket characteristics. Selected shipments were run against the applicable SAS program to determine estimated shipment rates. The SAS program then totaled the shipment cost for the selected QUICKTRANS shipment bucket.

6. Total Costs of Alternative Scenarios

The estimated cost for placing QUICKTRANS system shipments under the QUICKTRANS alternative where TP1 and TP2 QUICKTRANS airlift shipments remained air eligible are summarized in Table 8. For truck shipments in the unshaded buckets, shipments were consolidated if more than one shipment moved on the same date from identical consignor UIC destined for the same consignee UIC. Thus, 33,836 original data base shipments were combined to 20,949 shipments in the QUICKTRANS

TP3 and TP4/CONTRUCK TP1 through TP4 bucket for shipments moving as clean truck freight (hazardous and outsized material was assumed to become clean freight when moved from air to truck transportation).

Hybrid dirty shipments were combined with security shipments in the unshaded portion of Table 8 because security freight was the most costly dirty freight characteristic and over 95 percent of dirty freight had a security designation in the sample data base.

TABLE 8: QUICKTRANS ALTERNATIVE COST

	QUICKTRANS TP1/2 Air	QUICKTRAN S TP3 & TP4	CONTRUC K TP1-TP4	NDTS TP1-TP4
Clean < = 150 lbs.	\$ 1,929,417	Shipments 33,836 \$ 961,757	Combined 20,949	Shipments 23,353 Combined 2,052 \$ 115,086
Clean > 150 lbs.	\$ 5,693,657			
Outsized	\$11,246,625			
Hazardous	\$ 255,586			
Security	\$ 2,085,813	\$ 195,930	Combined 204	\$ 39,288
Hybrid Dirty	\$ 844,483	Shipments 247		Ship/Com 84/75
Total Cost	\$22,055,581	\$1,157,687		\$ 154,374

The costs shown in each bucket in Table 8 sum to a grand total of \$23,367,642. Since the QUICKTRANS alternative represents one third of FY 92 shipments, the total estimated cost of the QUICKTRANS alternative scenario is \$70,102,925 (\$23,367,642 times 3).

Of particular interest is the large cost of moving dirty freight by air. Dirty freight air shipments make up over 54 percent of all costs. Outsized air freight shipments alone comprise over 48 percent of all alternative transportation costs.

All shipments in the QUICKTRANS sample data base that were shown as a TP1 shipment were air eligible under the TP1 alternative. This included NDTs and CONTRUCK TP1 shipments as well as QUICKTRANS airlift shipments. The estimated cost for moving QUICKTRANS system shipments under the TP1 alternative is shown in Table 9. The grand total cost for the TP1 buckets is \$20,417,247. Multiplying results by three gives a total FY 92 cost of \$61,251,741 for the TP1 alternative scenario.

TABLE 9: TP1 ALTERNATIVE COST

	QUICKTRANS TP1 Air	QUICKTRAN S TP2-TP4	CONTRUC K TP2-TP4	NDTS TP2-TP4
Clean < = 150 lbs.	\$ 1,786,653	Shipments 67,297 \$1,559,229	Combined 42,316	Shipments 20,228 Combined 5,362 \$ 191,858
Clean > 150 lbs.	\$ 4,593,796			
Outsized	\$ 8,906,503			
Hazardous	\$ 209,277			
Security	\$ 1,487,055	\$1,035,559	Combined 992	\$ 24,582
Hybrid Dirty	\$ 622,735			Shipments 1,195
Total	\$17,606,019	\$2,594,788		\$ 216,440

Both the TP1 and QUICKTRANS alternatives are based on the 170,146 shipment sample size, but the QUICKTRANS alternative ships more material by air.

The \$61,251,741 estimated TP1 alternative cost is well below the \$70,102,866 estimated QUICKTRANS alternative cost. The cost savings shown for the TP1 alternative result from diverting 31,255 air shipments to truck transportation.

The estimated cost for placing QUICKTRANS system shipments under the DLA alternative, where shipments citing RDD N__, E__, 555, 777, or 999 on shipment documentation remained air eligible, is summarized in Table 10.

TABLE 10: DLA ALTERNATIVE COST

	RDD N__, E__, 555, 777, 999 Air	RDD Other Than N__, E__, 555, 777, 999 Truck
Clean <= 150 lbs.	\$ 788,144	Shipments/Combined 39,250/27,907 \$ 1,186,773
Clean > 150 lbs.	\$ 1,781,638	
Outsized	\$ 4,033,697	
Hazardous	\$ 96,520	
Security	\$ 815,413	Ship/Comb 1179/982 \$ 1,072,041
Hybrid Dirty	\$ 268,716	
Total Cost	\$ 7,784,128	\$ 2,258,814

For the RDD buckets, costs sum to a total of \$10,042,972. The sample size included only 86,116 or 170,149 possible data base shipments. Therefore, the total bucket cost was multiplied by 1.9758 (170,149 divided by 86,116) to compensate for the reduced sample size. Results were then multiplied by three to obtain a total estimated FY 92 cost of \$59,528,886 for the RDD alternative scenario.

Outsized shipment costs are still the dominant cost bucket, comprising just over 40 percent of all costs. Total costs of \$59,527,286 is fairly close to the total cost of \$61,251,741 obtained for the TP1 alternative.

The Air Force alternative ships clean freight with a RDD of E__, N__, 555, 777, or 999 by air. Shipments not showing the high priority RDDs and all dirty freight shipments regardless of RDD were diverted to truck transportation. The estimated cost for moving QUICKTRANS system shipments under the Air Force alternative is shown in Table 11.

TABLE 11: AIR FORCE ALTERNATIVE COST

	RDD N__, E__, 555, 777, 999 Air	RDD Other Than N__, E__, 555, 777, 999 Truck
Clean <= 150 lbs.	\$ 788,144	Shipments/Combined 42,407/13,472 \$ 1,392,850
Clean > 150 lbs.	\$ 1,781,638	
Outsized	\$ 0	
Hazardous	\$ 0	
Security	\$ 0	Ship/Comb 1195/1654 \$ 1,703,805
Hybrid Dirty	\$ 0	
Total Cost	\$ 2,569,782	\$ 3,096,655

The sum of the Air Force alternative buckets is \$5,666,437. Multiplying by 1.9578 to compensate for reduced sample size produces a total of \$11,195,812 for the Air Force sample. Multiplying by three to estimate total FY 92 Air Force alternative scenario cost provides a total cost of \$33,587,438.

The low cost of the Air Force alternative is no surprise. Truck transportation is generally less expensive than air transportation. The effect of using slower truck transportation for movement of high priority dirty freight to fleet units is more than a question of cost. Readiness will be degraded by lengthening the logistics transportation pipeline. If declines in readiness caused by using slower less expensive transportation

can be isolated from other factors affecting readiness, that decline must be balanced against potential transportation cost savings. However, quantifying any decline in operational readiness associated with possible reductions in premium transportation of high priority material is very difficult and beyond the scope of this thesis.

VI. QUICKTRANS AND ALTERNATIVE SCENARIO COST COMPARISON

This chapter compares the FY 92 cost of the QUICKTRANS system with the cost of moving QUICKTRANS shipments via alternative commercial transportation. The total FY 92 cost of the QUICKTRANS system shown in Chapter III and alternative commercial scenario costs as developed in Chapter V are contrasted. Costs by freight category are shown for each competing alternative.

The importance of outsized freight costs is highlighted. The effect of using alternate rules for dimensional weight computation of outsized shipments is examined. The high cost of security freight is briefly discussed. Indirect costs associated with canceling the QUICKTRANS system are considered in the final part of this chapter.

A. FY 92 TOTAL COST COMPARISON

The total FY 92 cost for QUICKTRANS system operation was \$47,242,905. Navy Expediting and Consolidation Program (NECP) costs were part of the terminal services contract portion of total QUICKTRANS costs. The primary reason for NECP services is to save Navy shipping dollars through consolidating shipments prior to export by AMC or sealift. The NECP related terminal services would become an autonomous contract if QUICKTRANS shipment service was terminated. Therefore, the annual cost of \$2,515,099 for FY 92 NECP functions [Ref. 22] needs to be subtracted from total

QUICKTRANS system costs before costs are compared with alternative commercial scenarios. The adjusted FY 92 cost QUICKTRANS system is \$44,727,706.

QUICKTRANS system total operating cost is compared with the alternative commercial scenario costs in Table 12. The QUICKTRANS alternative scenario, which attempts to duplicate QUICKTRANS system movements using commercial carriers, is very expensive. Even the DLA and TP1 commercial alternative scenarios appear to be significantly more expensive than the current QUICKTRANS system. The QUICKTRANS system moved more high priority shipments by air than the competing QUICKTRANS, TP1, and DLA alternatives with less expense. The Air Force alternative is 21 percent cheaper than the QUICKTRANS system. However, this savings must be balanced against the cost in fleet readiness caused by diverting all high priority dirty freight shipments to commercial truck.

TABLE 12: QUICKTRANS SYSTEM AND ALTERNATIVE SCENARIO COST

ALTERNATIVE SCENARIO	TOTAL SHIPMENT COST	PERCENT QUICK SYS COST	PERCENT AIR SHIPMENTS	PERCENT DIRTY AIR SHIPMENT S
QUICK SYS	\$44,727,806	100.00%	66.19%	9.80%
QUICKTRANS	\$70,102,925	156.73%	66.19%	9.80%
TP1	\$61,251,741	136.94%	47.82%	9.89%
DLA	\$59,527,286	133.09%	52.74%	8.17%
AIR FORCE	\$33,587,438	75.09%	48.43%	0.00%

B. FREIGHT CATEGORY COMPARISON

What categories of freight are the main cost drivers for the QUICKTRANS system and competing alternative scenarios? The relative importance of various freight movement costs can be seen in Figure 7.

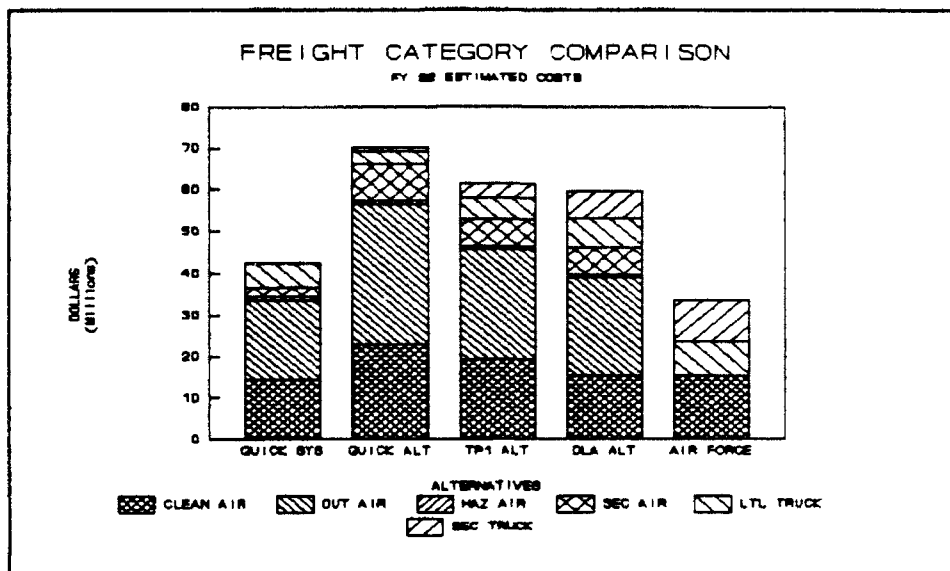


Figure 7: FY 92 Costs by Freight Category

The QUICKTRANS system freight category costs were estimated by summing the QUICKTRANS bill entry in the sample data base for May and August 1992. The sample data base months of November 1991 and February 1992 were excluded in the cost comparison because NAVMTO did not begin its new shipment billing structure until April 1992. The costs shown above reflect NAVMTO's revised billing procedure that assesses hazardous shipments at two times base pound miles, security shipments at five times base pound miles, outsized shipments at five times base pound miles, and gives rate breaks based on distance shipped.

Dirty freight outsized air shipments are the largest cost driver for all alternatives except the Air Force alternative which does not move dirty freight by air. The second largest cost driver is clean air shipments. A surprising result is the high cost of security freight when moved by truck. LTL trucking shipments become higher as more freight is diverted from air to ground transport. Hazardous shipments are not a major cost driver.

1. Outsized Freight Costs

The costs associated with moving outsized freight are significant. In Figure 7, outsized shipments are any shipments over 72 inches in length, width, or height. However, commercial carriers usually define outsized freight as shipments that do not fit on a standard 88 by 125 inch commercial pallet. In the cost model, any shipments that exceed commercial pallet dimensions are charged 4,500 pounds for each pallet position the outsized shipment occupies.

In air cargo guaranteed traffic awards, rules for air cargo dimensional weight computation can be dictated by the government. All bidders for the traffic submit tenders based on anticipated volume of traffic and the rules set forth in the bid solicitation.

Defense Distribution Region West (DDRW) is the DLA activity resulting from DOD supply and depot consolidation mandated by DMR 902. Located in northern California, DDRW's main components include Defense Depot Tracy, Sharpe Army Depot, Naval Supply Center Oakland, and Navy Aviation Depot Alameda. DDRW's

rules for dimensional freight for an air cargo GTA from DDRW to all sites in CONUS are as follows:

... the carrier will be entitled to the greater of the actual weight or the dimensional weight for shipments which exceed 125 inches in length, 88 inches in width, and 52 inches in height, or 405 inches in length and girth combined. ...to calculate the dimensional weight for shipments which exceed the dimensions in subparagraph b.1. above, multiply the greatest length times the greatest width times the greatest height of each shipment (all in inches) and divide by 194. If the dimensional weight exceeds the actual weight, charges based on the dimensional weight will apply. [Ref.34]

The effect of the DDRW GTA dimensional weight rules on total charges paid for movement of outsized freight is dramatic. A comparison between using the DDRW dimensional weight standard for outsized freight shipments and the 4500 pound per pallet standard for the QUICKTRANS alternative scenario is shown in Table 13.¹⁶ Net cost savings obtained by changing dimensional weight provisions to the DDRW standard are \$26,283,627 for the QUICKTRANS alternative scenario (\$11,246,625 minus \$2,485,416 times 3).

¹⁶ The length times width times height divided by 194 dimensional weight standard was substituted in the Danzas Outsized SAS program for the 4500 pound per pallet standard. Changing the dimensional weight provision lowered the shipment weight by 21,576,609 pounds (22,548,136 less 971,527).

TABLE 13: TOTAL COST OF DIMENSIONAL WEIGHT

OUTSIZED FREIGHT QUICKTRANS ALT.	4500 POUND STANDARD	DDRW LxWxH/194 STANDARD
TOTAL COMPUTED WEIGHT	27,593,197	6,016,588
LESS ACTUAL WEIGHT LBS.	5,045,061	5,045,061
DIMENSIONAL WEIGHT	22,548,136	971,527
TOTAL COST	\$11,246,625	\$ 2,485,416
COST PER COMPUTED LB.	\$.407586	\$.413094

Changing the outsized cargo dimensional weight rule makes QUICKTRANS alternative scenario FY 92 costs decline to \$43,819,299. This cost is slightly less than the QUICKTRANS system cost of \$44,727,806.

But can the DDRW dimensional weight rule be exported to QUICKTRANS shipments? Probably not without rate increases to compensate carriers for lost revenue. DDRW's GTA is specifically for DDRW shipments originating in one geographical area. QUICKTRANS outsized shipments originate at widely dispersed QUICKTRANS origin points. The volume of "guaranteed traffic" generated by DDRW is also greater than the traffic QUICKTRANS generates in the same geographical area.

With the total number and weight of QUICKTRANS shipments declining, commercial carriers are unlikely to give QUICKTRANS shipments rate breaks comparable to those negotiated for DDRW. Also, entering into a GTA agreement is risky for QUICKTRANS given that a large percentage of QUICKTRANS outsized air shipments may gravitate to DLA control. In short, the probability that QUICKTRANS

will be able to duplicate DDRW GTA rates in a solicitation to replace QUICKTRANS with alternative commercial carriers is small.

2. Security Freight Costs

Security freight shipment costs were estimated in the cost model by assuming 70 percent of QUICKTRANS security shipments required Constant Surveillance Service (CS) and 30 percent required just Signature and Tally Record Service (ST). The ST service was tabulated by using the LTL truck class 100 rates and adding a \$25 ST fee. The CS rates used a 2500 pound minimum shipment weight and applicable charges for CS shipment movement. This procedure was conservative.

At least 62 shipments in the sample data base required protective service (PS). PS service mandates a 5000 pound minimum shipment weight and rates over twice as high as CS service rates for each mile a shipment moves by truck. If these shipments are diverted to ground transportation, average shipping charges can easily exceed a dollar a pound. The QUICKTRANS revised rate structure charges about \$.75 cents a pound for any security shipment. QUICKTRANS airlift PS service is less expensive than moving material requiring PS service by truck.

Additionally, QUICKTRANS is about three times cheaper than Emery Worldwide for air shipment of any security cargo requiring CS service (\$.75 a pound compared to \$2.20 a pound). Security truck rates for security movements in the cost model were about \$.50 a pound for CS shipments. CONTRUCK and NDTs CS

shipment rates are about \$.25 a pound. The QUICKTRANS system enjoys a competitive advantage over commercial carriers in moving shipments requiring security precautions.

C. INDIRECT COSTS

Direct QUICKTRANS system operational costs are summarized in Chapter IV. This section describes indirect costs that will be incurred if QUICKTRANS is terminated. Although not directly associated with alternative commercial carrier shipping costs, they are mentioned here as a reminder of possible indirect cost increases to be incurred if QUICKTRANS service is terminated.

1. GBL and CBL Preparation and Processing Costs

The QUICKTRANS system does not require GBLs or CBLs for shipment documentation. QUICKTRANS uses documentation largely produced as a byproduct of processing a requisition for issue in the supply system.

A meeting with traffic managers at the Lemoore QUICKTRANS point confirmed the ease of QUICKTRANS shipment documentation processing when compared with producing a GBL or CBL. Traffic managers estimated GBL preparation to take five times that of QUICKTRANS shipment documentation. CBL preparation was judged to take about two and one half times longer than QUICKTRANS shipment documentation. When asked about the impact on NAS Lemoore if QUICKTRANS was

terminated, the traffic manager cited a need for at least one additional employee in the shipping office.¹⁷

In addition to GBL preparation, the GBL or CBL must be processed for payment. No GBLs or CBLs are needed for QUICKTRANS billing. The QUICKTRANS data base totals all shipment costs by transportation account code and produces a single bill at the end of the month for each transportation account code. The cost of this service is prorated to QUICKTRANS customers as part of annual QUICKTRANS costs.

The cost to NAVMTO for GBL processing was listed at \$50 by the Naval Audit Service in 1978 [Ref. 35]. Another study conducted by the Defense Audit Service in 1979 resulted in a cost for GBL processing of \$8.12 and CBL processing of \$6.63 [Ref. 36]. There is a large disparity between \$50 and \$8.12. Being conservative, the 1979 processing cost was adjusted for inflation. Resulting FY 92 costs were \$15.02 for GBL and \$12.26 for CBL processing.

With no hard current data to justify GBL and CBL bill processing costs, the cost of \$15.02 per GBL and \$12.26 for CBL processing was chosen to estimate additional costs incurred if QUICKTRANS is terminated. The QUICKTRANS sample data base was queried to determine the estimated number of extra CBLs and GBLs required annually in the absence of QUICKTRANS. GBLs were required if estimated

¹⁷. Meeting between Ms. Pam Yanes, NAS Lemoore Freight Rate Specialist, Ms. Arlene Nava, McDonnell Douglas Transportation Officer, and Mr. Lane Clark, McDonnell Douglas Shipping Clerk and author, NAS Lemoore, 7 November, 1992.

commercial shipping cost exceeded \$250 for air shipments or \$100 for truck shipments. CBLs were used for all other shipments. Consolidation of shipments from identical consignor UICs to identical consignee UICs received by QUICKTRANS on the same day was allowed. The total cost associated with GBL and CBL processing was estimated to be 70,704 GBL shipments times \$15.02 plus 257,301 CBL shipments times \$12.26 for a grand total of \$4,216,484.

This cost was not added to the cost estimate for the alternative commercial scenarios primarily because of the uncertainty of the GBL and CBL processing costs. An updated study of these costs is needed to ensure costs have not radically increased or decreased before a cost can be estimated with a reasonable level of confidence. Advances in computer technology, especially electronic data interchange, may have decreased the preparation and processing time for GBLs and CBLs. Rapid advances in this area are probable in the near future. On the other hand, overhead necessary for the security, audit, and accountability of GBLs was not listed as a cost in the 1979 GBL processing estimate.

2. NECP Contracting Cost

NECP functions are part of the QUICKTRANS terminal services contract. The contractor achieves economies of scale by performing QUICKTRANS and NECP functions using the same QUICKTRANS data base computer system. Further, personnel can be cross trained to perform NECP and QUICKTRANS functions improving contractor productivity. If QUICKTRANS is terminated, contractor efficiency will decline and NECP contract costs can be expected to increase. The actual percentage

increase is unknown, but an increase of 15 percent of NECP contract costs seems reasonable. Taking the NECP annual contract cost of \$2,515,099 and multiplying by 15 percent gives an estimated annual cost increase of \$377,265.

3. Audit of Transportation Bills

In 1988, Karnas did a thesis on auditing government transportation bills. The thesis concluded that DOD was paying a minimum of \$48 million a year in overcharges on freight. Karnas also noted that NAVMTO accounted for approximately 15 percent of DOD freight shipments with \$592 million in freight transportation payments in FY 87. [Ref. 37: pp. 88, 92]

Because QUICKTRANS is primarily based on firm fixed price contracts, there is no incentive for the contractors to overcharge the government and thus no need to audit QUICKTRANS bills for overcharges. If QUICKTRANS is replaced, additional CBLs and GBLs will have to be audited to minimize transportation overcharges. The NAVMTO portion of overcharges in FY 87 (15 percent) multiplied by the estimated amount of DOD overcharges (\$48 million) which totals \$7.2 million. Taking the \$7.2 million and dividing by total transportation disbursements for NAVMTO, or \$592 million, shows 1.2162 percent of transportation payments to be overcharges. Additional overcharges for QUICKTRANS freight moved to alternative commercial carriers is estimated by multiplying FY 92 QUICKTRANS system costs of about \$45 million by 1.2162 percent. Total additional transportation freight overcharges if QUICKTRANS is replaced are \$547,290.

VII. SUMMARY, CONCLUSION, AND RECOMMENDATIONS

A. SUMMARY

The Navy's QUICKTRANS system has provided expedited air and ground transportation for CONUS high priority shipments between Navy operational sites since 1950. Contracts with commercial vendors for airlift, terminal, and trucking services, administered by NAVMTO, form the base for QUICKTRANS service. Continued operations for over forty years is testimony to the long term reliability, cost effectiveness, and flexibility of QUICKTRANS service.

The environment in which QUICKTRANS operates has changed rapidly since 1987. CONUS DOD supply depots have been consolidated under DLA which has no vested interest in moving freight by QUICKTRANS and has formed its own distribution networks with commercial carriers. DOD downsizing has further cut the demand for QUICKTRANS system service, commercial competition has increased, and LOGAIR has been disbanded.

In this rapidly evolving new environment, QUICKTRANS has to compete with other commercial transportation carriers for fewer DOD and Navy high priority shipments. The lack of the equivalent of a commercial tender with shipment rates for various categories of freight puts QUICKTRANS at a comparative disadvantage in this competition. Since QUICKTRANS shipping charges are based on the amount of revenue needed to pay QUICKTRANS contract costs, rates vary depending on the amount of

cargo moved each month. Because the QUICKTRANS system cost and billing structure does not allow for a direct comparison with commercial shipping fees, QUICKTRANS may not convince potential customers of cost savings.

The distinctive competence of QUICKTRANS has been the movement of dirty freight which requires special handling. Outsized, hazardous, temperature-controlled, and security shipments present a rich and varied data base. Each shipment may be subject to unique commercial shipping charges. The assumptions necessary to estimate the costs of moving these shipments outside the QUICKTRANS system mask the unique characteristics of each shipment which may lead to additional shipping fees.

The cost model developed in this thesis estimates the cost of replacing the QUICKTRANS system with readily available alternative commercial transportation. The cost of replacement depends on the rules applied to determine which QUICKTRANS shipments will be shipped by air transportation. Regardless of the combination of commercial alternatives selected to assume shipment of QUICKTRANS freight, total costs decline as the number and types of air eligible shipments decline.

B. CONCLUSIONS

The future of QUICKTRANS depends on its ability to maintain shipment volume. Since FY 1987, the monthly weight of QUICKTRANS airlift shipments has fallen by approximately 40 percent. This trend must be stopped, or even reversed, in order to keep the shipment volumes needed to prevent QUICKTRANS shipment fees from increasing for remaining customers.

Selection of a carrier to move government freight is usually based on cost. To convince customers QUICKTRANS service is less expensive than comparable service provided by commercial carriers, firm published rates for QUICKTRANS transportation services for each category of freight moved is critical. Without a firm shipment cost that can be easily compared with other shipper's rates, QUICKTRANS will continue to lose its share of a shrinking DOD customer base.

Each QUICKTRANS shipment is unique. The cost model developed in this thesis estimated the cost of shipments by treating all shipments alike within a category of freight. In order to more accurately estimate the cost of replacing QUICKTRANS with readily available commercial transportation, the nature and true shipping cost of the type of material within each freight category needs to be thoroughly researched.

The total costs of shipping cargo via QUICKTRANS compares favorably with shipping the same material via readily available alternative commercial transportation systems. The comparative cost advantage of QUICKTRANS is in movement of dirty freight, especially oversized and security air shipments. If commercial air freight forwarders are willing to extend to QUICKTRANS customers those rules for dimensional oversized freight shipments which have been given to DDRW, the cost advantage for oversized QUICKTRANS shipments disappears. QUICKTRANS system costs then become similar to alternative commercial carrier costs.

Indirect costs incurred if QUICKTRANS contracts are not renewed need to be considered when evaluating any decision on the future of the QUICKTRANS system.

More research is needed to firmly establish the applicability and validity of indirect costs, especially the cost for GBL and CBL processing.

C. RECOMMENDATIONS

The following recommendations are made to improve the competitive position of QUICKTRANS vis a vis alternative commercial transportation:

1. Publish the equivalent of a commercial tender for the QUICKTRANS system. The rate structure can be periodically adjusted to recover funds necessary to balance Navy Management Fund expenditures with QUICKTRANS revenues.
2. Confirm the cost advantage to security freight shippers of moving security shipments by QUICKTRANS. If confirmed, market the distinctive QUICKTRANS competence in moving security shipments to potential customers.

The cost model developed in this thesis for estimating the shipping fees charged by alternative commercial carriers treats all shipments identically within a freight category.

The following recommendations are made to ensure estimated costs actually reflect the wide diversity found in the type of material moved in QUICKTRANS.

1. Conduct research on each type of material shipped in QUICKTRANS freight categories to ensure the cost for moving shipments by alternative commercial transportation is accurately estimated.
2. Obtain from the Air Force the actual FY 93 cost of moving shipments that would have moved via LOGAIR, by type of material and freight category if possible, in order to confirm the estimated cost of QUICKTRANS replacement before beginning any QUICKTRANS replacement action.

The final recommendation depends on the future demand for QUICKTRANS airlift shipping services. QUICKTRANS contract costs are largely fixed. The more freight moved by QUICKTRANS the greater the cost savings for customers. However, the demand for QUICKTRANS airlift transportation services is declining. As the number

of customers declines, so does the cost effectiveness of QUICKTRANS for remaining customers. Use of alternative commercial carriers allows shippers to tailor their mode of shipment and related costs to competing demands for fast transportation and available transportation budgets.

If declines in QUICKTRANS airlift shipments continue at an annual rate of over seven percent in FY 93, plan for termination of the QUICKTRANS system by the end of FY 94 or no later than the expiration of the five year QUICKTRANS terminal services contract on 31 March 1995 [Ref. 1].

APPENDIX A

QUICKTRANS FLIGHT SCHEDULE

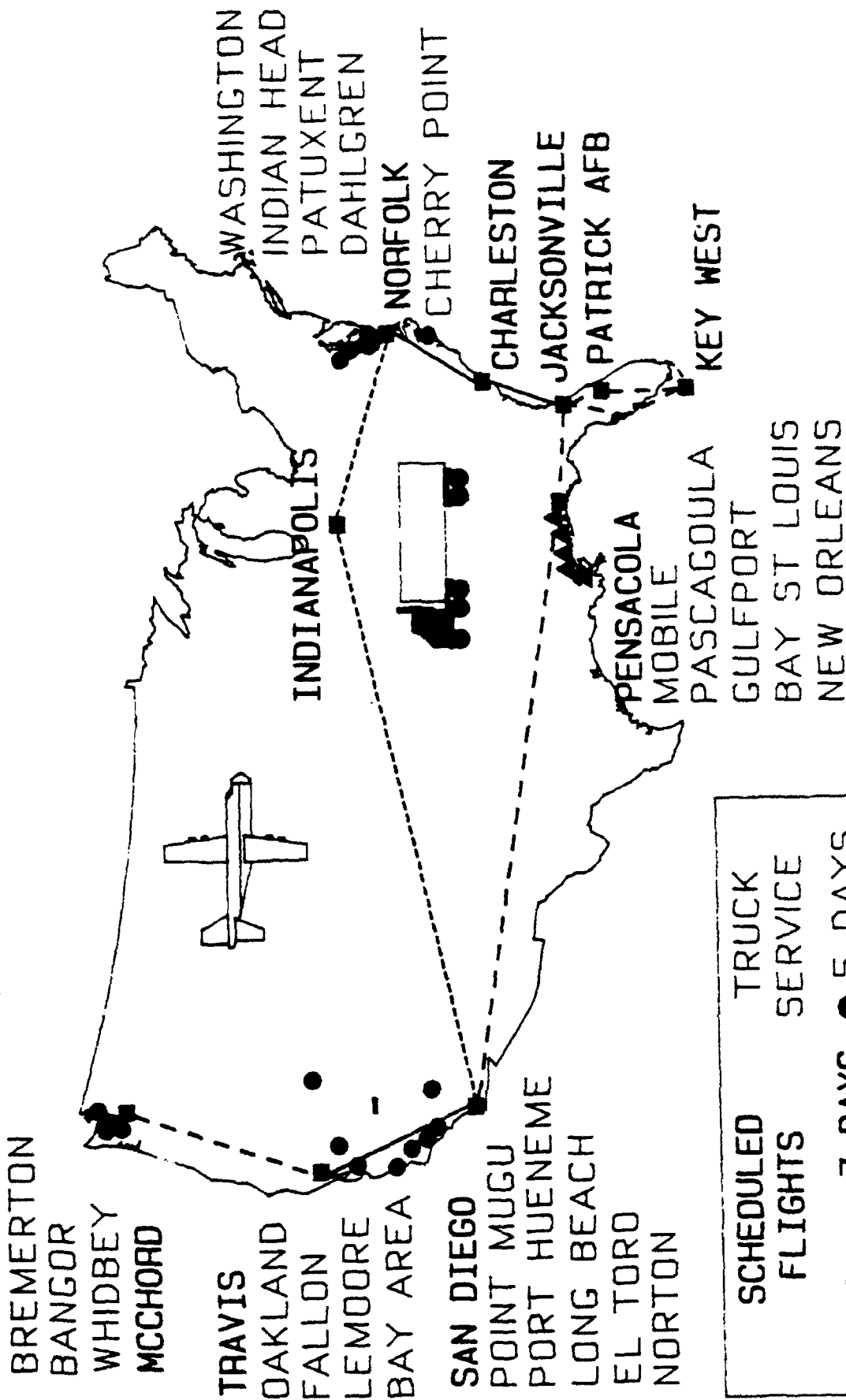
ALL TIMES LOCAL

L7Q	123	151	FLIGHT NUMBER		152	124	624	252
TUE thru SAT	MON FRI	TUE WED THU SAT SUN	OPERATING DAYS		MON TUE WED FRI SAT	SUN THU	SUN THU	SUN thru THU
	ORIG 0430	ORIG 0405	AR LV	TERMINALS	LV AR	TERM 0125	TERM 0205	
		0550 0650	AR LV	CHARLESTON-CHS	LV AR	2355 2255	0035 2335	
ORIG 1035		0800 0915	AR LV	JACKSONVILLE-NIP	LV AR	2150 2035	TERM 2100	2230 ORIG
			AR LV	CHARLESTON-CHS	LV AR		1950 1850	
			AR LV	NORFOLK-NGU	LV AR		1705 1550	
		0945 1045	AR LV	PENSACOLA-NPA	LV AR	1815 1715		
	0600* 0830*		AR LV	INDIANAPOLIS-IND	LV AR		1240* 1140*	
	1300 1415	1505 1620	AR LV	SAN DIEGO-NZY	LV AR	0940 0825	0405 0250	
	1615 TERM	1820 TERM	AR LV	TRAVIS-SUU	LV AR	0635 ORIG	0101 ORIG	TERM 0335
1120 1205			AR LV	PATRICK-COF	LV AR			
1430 1515			AR LV	KEY WEST-NQX	LV AR			
1740 TERM			AR LV	JACKSONVILLE-NIP	LV AR			
			AR LV	MCCHORD-TCM	LV AR			0120 2350
			AR LV	TRAVIS-SUU	LV AR			2130 ORIG

*INDIANAPOLIS IS ONE HOUR LATER DURING
STANDARD (NON-DAYLIGHT) TIME.

REPRODUCED AT GOVERNMENT EXPENSE

QUICKTRANS*



*INCLUDES CONTRUCK SERVICE TO ALL POINTS EXCEPT INDIANAPOLIS. CONTRUCK SERVICE IN FLORIDA AND NORTHBOUND FROM TRAVIS IS LIMITED.

Figure 2

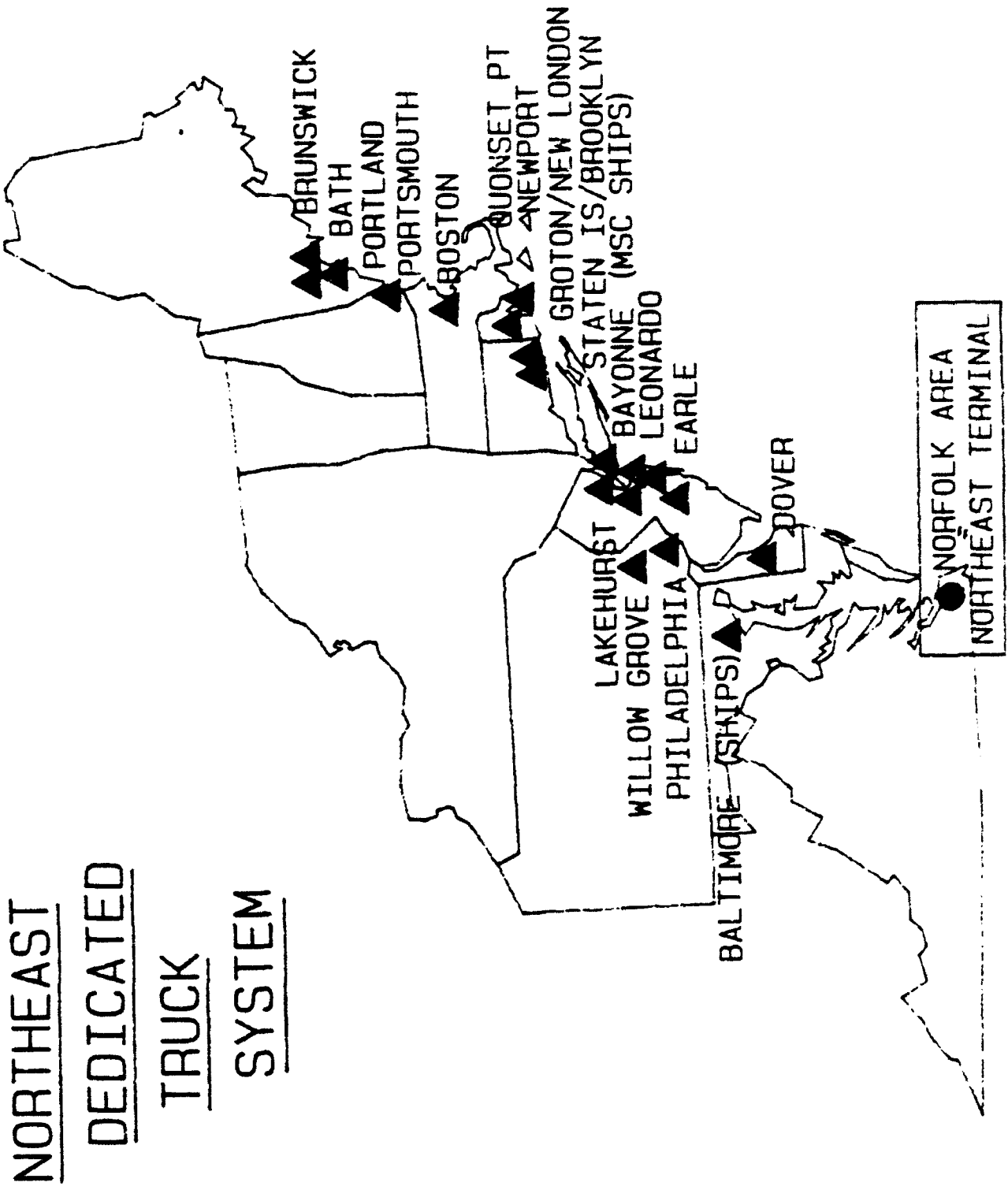


Figure 4

APPENDIX D

COST MODEL SAS PROGRAMS

The SAS programs used in the cost model to estimate alternative commercial transportation costs are contained in this appendix as follows:

1. Federal Express SAS, pages 89-92;
2. Danzas SAS, pages 93-95;
3. Danzas Outsized SAS, pages 96-98;
4. Emery SAS, pages 99-101;
5. LTL Truck SAS, pages 102-107;
6. LTL Truck Security SAS, pages 108-113.

```

//CHITWOOD  JOB (7291,9999),'CHITWOOD SAS',CLASS=B
//  EXEC SAS
//WORK DD UNIT=SYSDA,SPACE=(CYL,(40,10))
//DATAIN DD DISP=SHR,DSN=MSS.S7291.AUGUST
//      DD DISP=SHR,DSN=MSS.S7291.FEB
//      DD DISP=SHR,DSN=MSS.S7291.MAY
//      DD DISP=SHR,DSN=MSS.S7291.NOV
//SYSIN DD *
DATA MONTHS;
    INFILE DATAIN;
    INPUT  TCN $ 1-17
           PIECES 18-20
           WGHT 21-25
           CUBE 26-28
           QTRORIG $ 30-32
           QTRDEST $ 33-35
           UICTO $ 36-41
           UICFM $ 42-47
           TRANSPRI $ 48
           TRANTYPE $ 49
           DATERECD 50-54
           DATESHPD 55-59
           BILL 60-67
           POE $ 68-70
           POD $ 71-73
           DIMS $ 74-84
           DIMCODE $ 85
           HAZSHIP $ 86
           SECSHIP $ 87
           REFSHIP $ 88
           AIRCOMM $ 89-90
           PRJCDE $ 91-93
           RDD $ 94-96;
PROC SORT; BY WGHT;
DATA FEDX;
    INPUT  WGHT 2-4
           RATE 7-12;
CARDS;
1      3.99
2      3.99
3      3.99
4      4.80
5      5.61
6      6.42
7      7.23
8      8.04
9      8.85
10     9.96
11    10.47
12    11.28
13    12.09
14    12.90

```

15	13.71
16	14.35
17	14.99
18	15.63
19	16.27
20	16.91
21	17.55
22	18.19
23	18.83
24	19.47
25	20.11
26	20.76
27	21.39
28	22.03
29	22.67
30	23.31
31	23.95
32	24.59
33	25.23
34	25.87
35	26.51
36	27.15
37	27.79
38	28.43
39	29.07
40	29.71
41	30.35
42	30.99
43	31.63
44	32.27
45	32.91
46	33.55
47	34.19
48	34.83
49	35.47
50	36.11
51	36.75
52	37.39
53	38.03
54	38.67
55	39.31
56	39.95
57	40.59
58	41.23
59	41.87
60	42.51
61	43.15
62	43.79
63	44.43
64	45.07
65	45.71
66	46.35

67	46.99
68	47.63
69	48.27
70	48.91
71	49.55
72	50.19
73	50.83
74	51.47
75	52.11
76	52.75
77	53.39
78	54.03
79	54.67
80	55.31
81	55.95
82	56.59
83	57.23
84	57.87
85	58.51
86	59.15
87	59.79
88	60.43
89	61.07
90	61.71
91	62.35
92	62.99
93	63.63
94	64.27
95	64.91
96	65.55
97	66.19
98	66.83
99	67.47
100	68.11
101	68.75
102	69.39
103	70.03
104	70.76
105	71.31
106	71.95
107	72.59
108	73.23
109	73.87
110	74.51
111	75.15
112	75.79
113	76.43
114	77.07
115	77.71
116	78.35
117	78.99
118	79.63

119	80.27
120	80.91
121	81.55
122	82.19
123	82.83
124	83.47
125	84.11
126	84.75
127	85.39
128	86.03
129	86.67
130	87.31
131	87.95
132	88.59
133	89.23
134	89.87
135	90.51
136	91.15
137	91.79
138	92.43
139	93.07
140	93.71
141	94.35
142	94.99
143	95.63
144	96.27
145	96.91
146	97.55
147	98.19
148	98.83
149	99.47
150	100.11

```

;
DATA COST;
MERGE MONTHS FEDX; BY WGHT;
IF WGHT <= 150;
IF TRANTYPE='Q';
IF TRANSPRI IN('1' '2');
IF DIMCODE=' ';
IF HAZSHIP=' ';
IF SECSHIP=' ';
IF REFSHIP=' ';
DIFFCOST=BILL-RATE;
PROC UNIVARIATE; VAR WGHT BILL RATE DIFFCOST;

```

```

//CHITWOOD JOB (7291,9999),'CHITWOOD SAS',CLASS=C
// EXEC SAS
//WORK DD UNIT=SYSDA,SPACE=(CYL,(40,10))
//DATAIN DD DISP=SHR,DSN=MSS.S7291.AUGUST
// DD DISP=SHR,DSN=MSS.S7291.FEB
// DD DISP=SHR,DSN=MSS.S7291.NOV
// DD DISP=SHR,DSN=MSS.S7291.MAY
//SYSIN DD *
DATA MONTHS;
  INFILE DATAIN;
  INPUT TCN $ 1-17
        PIECES 18-20
        WGHT 21-25
        CUBE 26-28
        QTRORIG $ 30-32
        QTRDEST $ 33-35
        U1CTO $ 36-41
        UICFM $ 42-47
        TRANSPRI $ 48
        TRANTYPE $ 49
        DATEREC D 50-54
        DATESHPD 55-59
        BILL 60-67
        POE $ 68-70
        POD $ 71-73
        DIML 74-76
        DIMW 78-80
        DIMH 82-84
        DIMCODE $ 85
        HAZSHIP $ 86
        SECSHIP $ 87
        REFSHIP $ 88
        AIRCOMM $ 89-90
        PRJCDE $ 91-93
        RDD $ 94;
  IF QTRORIG IN('LGB' 'NFL' 'NGZ' 'NLC' 'NTD' 'NUQ' 'NZJ' 'NZY'
    'PHU' 'SBD' 'SUU') THEN FROMZONE=8;
  ELSE IF QTRORIG IN('EFD' 'NUW' 'PWT' 'TCM' 'TRF') THEN FROMZONE=9;
  ELSE IF QTRORIG IN('NBG') THEN FROMZONE=5;
  ELSE IF QTRORIG IN('IND') THEN FROMZONE=4;
  ELSE IF QTRORIG IN('CHC' 'CHS' 'COF' 'NIP' 'NKT'
    'NPA' 'NQX') THEN FROMZONE=2;
  ELSE IF QTRORIG IN('AYI' 'GPT' 'PGL') THEN FROMZONE=3;
  ELSE IF QTRORIG IN('BAT' 'BOS'
    'DAH' 'DCA' 'DOV' 'EAR' 'INH' 'LEO'
    'NCO' 'NEL' 'NET' 'NGU' 'NHK' 'NHZ' 'NOA' 'NOP' 'NXX'
    'OQU' 'PHL' 'PNE' 'STN' 'TWH') THEN FROMZONE=1;
  IF QTRDEST IN('LGB' 'NFL' 'NGZ' 'NLC' 'NTD' 'NUQ' 'NZJ' 'NZY'
    'OAK' 'NSI' 'PHU' 'SBD' 'SUU' 'EDF') THEN TOZONE=8;
  ELSE IF QTRDEST IN('NUW' 'PWT' 'TCM' 'TRF') THEN TOZONE=9;
  ELSE IF QTRDEST IN('NBG') THEN TOZONE=5;
  ELSE IF QTRDEST IN('IND') THEN TOZONE=4;

```



```

ELSE IF QTRDEST IN('CDD' 'CHC' 'CHS' 'COF' 'NIP' 'NKT'
'NPA' 'NQX') THEN TOZONE=2;
ELSE IF QTRDEST IN('AYI' 'GPT' 'MOB' 'PGL') THEN TOZONE =3;
ELSE IF QTRDEST IN('BAL' 'BAT' 'BOS' 'BST'
'DAH' 'DAV' 'DCA' 'DC' 'EAR' 'GON' 'INH' 'LEO' 'LYN' 'NZW'
'NCO' 'NEL' 'NET' 'NGU' 'NHK' 'NHZ' 'NJP' 'NOA' 'NOP' 'NXX'
'OQU' 'PHL' 'PNE' 'PSM' 'PVD' 'PWM' 'STN' 'TWH') THEN TOZONE=1;

```

```
PROC SORT; BY FROMZONE TOZONE;
```

```
DATA UNIVERAT;
```

```
INPUT
```

```
FROMZONE 1
```

```
TOZONE 3
```

```
RATE1C 5-9
```

```
RATE2C 11-15
```

```
RATE3C 17-21
```

```
RATE4C 23-27
```

```
RATE5C 29-33
```

```
RATE1K 35-39
```

```
RATE2K 41-45
```

```
RATE3K 47-51;
```

```
CARDS;
```

```

1 1 35.80 33.00 32.25 31.50 30.70 28.35 26.70 25.30
1 2 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
1 3 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
1 4 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
1 5 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
1 8 67.45 64.40 63.55 62.70 61.85 58.35 54.85 51.40
1 9 67.45 64.40 63.55 62.70 61.85 58.35 54.85 51.40
2 1 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
2 2 35.80 33.00 32.25 31.50 30.70 28.35 26.70 25.30
2 3 39.55 36.75 36.10 35.50 34.90 32.10 30.25 28.85
2 4 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
2 5 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
2 8 67.45 64.40 63.55 62.70 61.85 58.35 54.85 51.40
2 9 67.45 64.40 63.55 62.70 61.85 58.35 54.85 51.40
3 1 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
3 2 39.55 36.75 36.10 35.50 34.90 32.10 30.25 28.85
3 3 39.55 36.75 36.10 35.50 34.90 32.10 30.25 28.85
3 4 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
3 5 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
3 8 77.65 74.15 73.25 72.30 71.40 67.90 64.65 61.40
3 9 77.65 74.15 73.25 72.30 71.40 67.90 64.65 61.40
4 1 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
4 2 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
4 3 46.95 43.95 43.40 42.85 42.30 39.05 37.20 34.90
4 4 35.80 33.00 32.25 31.50 30.70 28.35 26.70 25.30
4 5 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
4 8 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
4 9 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
5 1 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
5 2 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
5 3 46.95 43.95 43.40 42.85 42.30 39.05 37.20 34.90

```

5	4	54.40	51.15	50.55	49.90	49.30	46.05	43.70	40.90
5	5	35.80	33.00	32.25	31.50	30.70	28.35	26.70	25.30
5	8	73.00	69.75	68.90	68.05	67.20	63.65	60.70	57.20
5	9	73.00	69.75	68.90	68.05	67.20	63.65	60.70	57.20
8	1	54.40	51.15	50.55	49.90	49.30	46.05	43.70	40.90
8	2	73.00	69.75	68.90	68.05	67.20	63.65	60.70	57.20
8	3	77.65	74.15	73.25	72.30	71.40	67.90	64.65	61.40
8	4	64.65	61.85	61.60	60.10	59.25	55.80	52.80	49.55
8	5	67.45	64.40	63.55	62.70	61.85	58.35	54.85	51.40
8	8	39.55	36.75	36.10	35.50	34.90	32.10	30.25	28.85
8	9	46.95	43.95	43.40	42.85	42.30	39.05	37.20	34.90
9	1	54.40	51.15	50.55	49.90	49.30	46.05	43.70	40.90
9	2	73.00	69.75	68.90	68.05	67.20	63.65	60.70	57.20
9	3	77.65	74.15	73.25	72.30	71.40	67.90	64.65	61.40
9	4	64.65	61.85	61.60	60.10	59.25	55.80	52.80	49.55
9	5	67.45	64.40	63.55	62.70	61.85	58.35	54.85	51.40
9	8	46.95	43.95	43.40	42.85	42.30	39.05	37.20	34.90
9	9	39.55	36.75	36.10	35.50	34.90	32.10	30.25	28.85

```

;
PROC SORT; BY FROMZONE TOZONE;
DATA CSSCOST;
MERGE MONTHS UNIVERAT; BY FROMZONE TOZONE;
IF WGHT <= 191 THEN RATE=RATE1C;
IF WGHT < 296 =>191 THEN RATE=RATE2C;
IF WGHT < 394 =>296 THEN RATE=RATE3C;
IF WGHT < 493 =>394 THEN RATE=RATE4C;
IF WGHT < 932 =>493 THEN RATE=RATE5C;
IF WGHT < 1890 => 932 THEN RATE=RATE1K;
IF WGHT < 2820 =>1890 THEN RATE=RATE2K;
IF WGHT >= 2820 THEN RATE=RATE3K;
IF WGHT >150;
IF RDD IN('E' 'N' '5' '7' '9');
IF DIMCODE=' ';
IF SECSHIP=' ';
IF HAZSHIP=' ';
IF REFSHIP=' ';
DANCOST = WGHT/100*RATE;
DIFFCOST = BILL - DANCOST;
PROC UNIVARIATE; VAR WGHT BILL DANCOST DIFFCOST;

```

```

//CHITWOOD JOB (7291,9999),'CHITWOOD SAS',CLASS=C
// EXEC SAS
//WORK DD UNIT=SYSDA,SPACE=(CYL,(40,10))
//DATAIN DD DISP=SHR,DSN=MSS.S7291.AUGUST
// DD DISP=SHR,DSN=MSS.S7291.FEB
// DD DISP=SHR,DSN=MSS.S7291.NOV
// DD DISP=SHR,DSN=MSS.S7291.MAY
//SYSIN DD *
DATA MONTHS;
  INFILE DATAIN;
  INPUT TCN $ 1-17
        PIECES 18-20
        WGHT 21-25
        CUBE 26-28
        QTRORIG $ 30-32
        QTRDEST $ 33-35
        UICTO $ 36-41
        UICFM $ 42-47
        TRANSPRI $ 48
        TRANTYPE $ 49
        DATERECD 50-54
        DATESHPD 55-59
        BILL 60-67
        POE $ 68-70
        POD $ 71-73
        DIML 74-76
        DIMW 78-80
        DIMH 82-84
        DIMCODE $ 85
        HAZSHIP $ 86
        SECSHIP $ 87
        REFSHIP $ 88
        AIRCOMM $ 89-90
        PRJCDE $ 91-93
        RDD $ 94;
  IF QTRORIG IN('LGB' 'NFL' 'NGZ' 'NLC' 'NTD' 'NUQ' 'NZJ' 'NZY'
    'PHU' 'SBD' 'SUU')THEN FROMZONE=8;
  ELSE IF QTRORIG IN('EFD' 'NUW' 'PWT' 'TCM' 'TRF')THEN FROMZONE=9;
  ELSE IF QTRORIG IN('NBG')THEN FROMZONE=5;
  ELSE IF QTRORIG IN('IND')THEN FROMZONE=4;
  ELSE IF QTRORIG IN('CHC' 'CHS' 'COF' 'NIP' 'NKT'
    'NPA' 'NQX')THEN FROMZONE=2;
  ELSE IF QTRORIG IN('AYI' 'GPT' 'PGL')THEN FROMZONE =3;
  ELSE IF QTRORIG IN('BAT' 'BOS'
    'DAH' 'DCA' 'DOV' 'EAR' 'INH' 'LEO'
    'NCO' 'NEL' 'NET' 'NGU' 'NHK' 'NHZ' 'NOA' 'NOP' 'NXX'
    'OQU' 'PHL' 'PNE' 'STN' 'TWH')THEN FROMZONE=1;
  IF QTRDEST IN('LGB' 'NFL' 'NGZ' 'NLC' 'NTD' 'NUQ' 'NZJ' 'NZY'
    'OAK' 'NSI' 'PHU' 'SBD' 'SUU' 'EDF')THEN TOZONE=8;
  ELSE IF QTRDEST IN('NUW' 'PWT' 'TCM' 'TRF')THEN TOZONE=9;
  ELSE IF QTRDEST IN('NBG')THEN TOZONE=5;
  ELSE IF QTRDEST IN('IND')THEN TOZONE=4;

```

```

ELSE IF QTRDEST IN('CDD' 'CHC' 'CHS' 'COF' 'NIP' 'NKT'
'NPA' 'NQX')THEN TOZONE=2;
ELSE IF QTRDEST IN('AYI' 'GPT' 'MOB' 'PGL')THEN TOZONE =3;
ELSE IF QTRDEST IN('BAL' 'BAT' 'BOS' 'BST'
'DAH' 'DAV' 'DCA' 'DOV' 'EAR' 'GON' 'INH' 'LEO' 'LYN' 'NZW'
'NCO' 'NEL' 'NET' 'NGU' 'NHK' 'NHZ' 'NJP' 'NOA' 'NOP' 'NXX'
'OQU' 'PHL' 'PNE' 'PSM' 'PVD' 'PWM' 'STN' 'TWH')THEN TOZONE=1;
PROC SORT; BY FROMZONE TOZONE;
DATA UNIVERAT;
  INPUT
    FROMZONE 1
    TOZONE 3
    RATE1C 5-9
    RATE2C 11-15
    RATE3C 17-21
    RATE4C 23-27
    RATE5C 29-33
    RATE1K 35-39
    RATE2K 41-45
    RATE3K 47-51;
CARDS;
1 1 35.80 33.00 32.25 31.50 30.70 28.35 26.70 25.30
1 2 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
1 3 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
1 4 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
1 5 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
1 8 67.45 64.40 63.55 62.70 61.85 58.35 54.85 51.40
1 9 67.45 64.40 63.55 62.70 61.85 58.35 54.85 51.40
2 1 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
2 2 35.80 33.00 32.25 31.50 30.70 28.35 26.70 25.30
2 3 39.55 36.75 36.10 35.50 34.90 32.10 30.25 28.85
2 4 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
2 5 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
2 8 67.45 64.40 63.55 62.70 61.85 58.35 54.85 51.40
2 9 67.45 64.40 63.55 62.70 61.85 58.35 54.85 51.40
3 1 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
3 2 39.55 36.75 36.10 35.50 34.90 32.10 30.25 28.85
3 3 39.55 36.75 36.10 35.50 34.90 32.10 30.25 28.85
3 4 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
3 5 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
3 8 77.65 74.15 73.25 72.30 71.40 67.90 64.65 61.40
3 9 77.65 74.15 73.25 72.30 71.40 67.90 64.65 61.40
4 1 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
4 2 50.70 47.65 47.05 46.45 45.80 42.80 40.70 38.15
4 3 46.95 43.95 43.40 42.85 42.30 39.05 37.20 34.90
4 4 35.80 33.00 32.25 31.50 30.70 28.35 26.70 25.30
4 5 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
4 8 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
4 9 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
5 1 64.65 61.85 61.60 60.10 59.25 55.80 52.80 49.55
5 2 54.40 51.15 50.55 49.90 49.30 46.05 43.70 40.90
5 3 46.95 43.95 43.40 42.85 42.30 39.05 37.20 34.90

```

5	4	54.40	51.15	50.55	49.90	49.30	46.05	43.70	40.90
5	5	35.80	33.00	32.25	31.50	30.70	28.35	26.70	25.30
5	8	73.00	69.75	68.90	68.05	67.20	63.65	60.70	57.20
5	9	73.00	69.75	68.90	68.05	67.20	63.65	60.70	57.20
8	1	54.40	51.15	50.55	49.90	49.30	46.05	43.70	40.90
8	2	73.00	69.75	68.90	68.05	67.20	63.65	60.70	57.20
8	3	77.65	74.15	73.25	72.30	71.40	67.90	64.65	61.40
8	4	64.65	61.85	61.60	60.10	59.25	55.80	52.80	49.55
8	5	67.45	64.40	63.55	62.70	61.85	58.35	54.85	51.40
8	8	39.55	36.75	36.10	35.50	34.90	32.10	30.25	28.85
8	9	46.95	43.95	43.40	42.85	42.30	39.05	37.20	34.90
9	1	54.40	51.15	50.55	49.90	49.30	46.05	43.70	40.90
9	2	73.00	69.75	68.90	68.05	67.20	63.65	60.70	57.20
9	3	77.65	74.15	73.25	72.30	71.40	67.90	64.65	61.40
9	4	64.65	61.85	61.60	60.10	59.25	55.80	52.80	49.55
9	5	67.45	64.40	63.55	62.70	61.85	58.35	54.85	51.40
9	8	46.95	43.95	43.40	42.85	42.30	39.05	37.20	34.90
9	9	39.55	36.75	36.10	35.50	34.90	32.10	30.25	28.85

```

;
PROC SORT; BY FROMZONE TOZONE;
DATA CSSCOST;
MERGE MONTHS UNIVERAT; BY FROMZONE TOZONE;
IF WGHT < 9000 AND (MAX(OF DIML, DIMH, DIMW) > 125 AND
MAX(OF DIML, DIMH, DIMW) <= 250)
THEN WGHT = 9000;
ELSE IF WGHT < 13500 AND (MAX(OF DIML, DIMH, DIMW) > 250 AND
MAX(OF DIML, DIMH, DIMW) <= 375)
THEN WGHT = 13500;
ELSE IF WGHT < 18000 AND (MAX(OF DIML, DIMH, DIMW) > 375 AND
MAX(OF DIML, DIMH, DIMW) <= 500)
THEN WGHT = 18000;
ELSE IF WGHT < 22500 AND (MAX(OF DIML, DIMH, DIMW) > 500 AND
MAX(OF DIML, DIMH, DIMW) <= 625)
THEN WGHT = 22500;
IF WGHT <= 191 THEN RATE=RATE1C;
IF WGHT < 296 => 191 THEN RATE=RATE2C;
IF WGHT < 394 => 296 THEN RATE=RATE3C;
IF WGHT < 493 => 394 THEN RATE=RATE4C;
IF WGHT < 932 => 493 THEN RATE=RATE5C;
IF WGHT < 1890 => 932 THEN RATE=RATE1K;
IF WGHT < 2820 => 1890 THEN RATE=RATE2K;
IF WGHT >= 2820 THEN RATE=RATE3K;
IF TRANTYPE = 'Q';
IF TRANSPRI IN('1' '2');
IF DIMCODE IN('A' 'B' 'C' 'D');
IF SECSHIP='';
OUTCOST = WGHT/100*RATE;
DIFFCOST = BILL - OUTCOST;
IF WGHT IN('9000' '13500' '18000' '22500') THEN OUTWGHT = 1;
PROC UNIVARIATE; VAR OUTWGHT WGHT BILL OUTCOST DIFFCOST;

```

//CHITWOOD JOB (7291,9999),'CHITWOOD SAS',CLASS=C

// EXEC SAS

//WORK DD UNIT=SYSDA,SPACE=(CYL,(40,10))

//DATAIN DD DISP=SHR,DSN=MSS.S7291.AUGUST

// DD DISP=SHR,DSN=MSS.S7291.MAY

// DD DISP=SHR,DSN=MSS.S7291.FEB

// DD DISP=SHR,DSN=MSS.S7291.NOV

//SYSIN DD *

DATA MONTHS;

INFILE DATAIN;

INPUT WGHT 21-25

QTRORIG \$ 30-32

QTRDEST \$ 33-35

TRANSPRI 48

TRANTYPE \$ 49

BILL 60-67

DIMCODE \$ 85

HAZSHIP \$ 86

SECSHIP \$ 87

REFSHIP \$ 88

AIRCOMM \$ 89-90

RDD \$ 94;

IF QTRORIG IN('LGB' 'NFL' 'NGZ' 'NLC' 'NTD' 'NUQ' 'NUW' 'NZJ' 'NZY'
'PHU' 'PWT' 'SBD' 'SUU' 'TCM' 'TRF' 'EDF' 'OAK')THEN FROMZONE=1;

ELSE IF QTRORIG IN('NBG')THEN FROMZONE=2;

ELSE IF QTRORIG IN('IND')THEN FROMZONE=3;

ELSE IF QTRORIG IN('AYI' 'CHC' 'CHS' 'COF' 'GPT' 'KBY' 'NIP' 'NKT'
'NPA' 'NQX' 'PGL' 'CDD' 'MOB')THEN FROMZONE=4;

ELSE IF QTRORIG IN('BAL' 'BAT' 'BAY' 'BDR' 'BOS' 'BST' 'BTW'
'DAH' 'DAV' 'DCA' 'DOV' 'EAR' 'GON' 'HFD' 'INH' 'LEO' 'LYN'
'NCO' 'NEL' 'NET' 'NGU' 'NHK' 'NHZ' 'NOA' 'NOP' 'NXX' 'NZW'
'OQU' 'PER' 'PHL' 'PNE' 'PSM' 'PVD' 'PWM' 'STN' 'TWH')

THEN FROMZONE=5;

IF QTRDEST IN('LGB' 'NFL' 'NGZ' 'NLC' 'NTD' 'NUQ' 'NUW' 'NZJ' 'NZY'
'NSI' 'PHU' 'PWT' 'SBD' 'SUU' 'TCM' 'TRF' 'EDF' 'OAK')THEN TOZONE=1;

ELSE IF QTRDEST IN('NBG')THEN TOZONE=2;

ELSE IF QTRDEST IN('IND')THEN TOZONE=3;

ELSE IF QTRDEST IN('AYI' 'CHC' 'CHS' 'COF' 'GPT' 'KBY' 'NIP' 'NKT'
'NPA' 'NQX' 'PGL' 'CDD' 'MOB')THEN TOZONE=4;

ELSE IF QTRDEST IN('BAL' 'BAT' 'BAY' 'BDR' 'BOS' 'BST' 'BTW'
'DAH' 'DAV' 'DCA' 'DOV' 'EAR' 'GON' 'HFD' 'INH' 'LEO' 'LYN'
'NCO' 'NEL' 'NET' 'NGU' 'NHK' 'NHZ' 'NOA' 'NOP' 'NXX' 'NZW'
'NJP' 'OQU' 'PER' 'PHL' 'PNE' 'PSM' 'PVD' 'PWM' 'STN' 'TWH')

THEN TOZONE=5;

PROC SORT; BY FROMZONE TOZONE;

DATA EMERYRAT;

INPUT

FROMZONE 1

TOZONE 3

SCALE \$ 5;

CARDS;

1 1 B

1 2 B
 1 3 A
 1 4 C
 1 5 E
 2 1 B
 2 2 B
 2 3 C
 2 4 C
 2 5 D
 3 1 B
 3 2 C
 3 3 A
 3 4 B
 3 5 B
 4 1 C
 4 2 C
 4 3 B
 4 4 B
 4 5 C
 5 1 E
 5 2 D
 5 3 B
 5 4 C
 5 5 A

```

;
PROC SORT; BY FROMZONE TOZONE;
DATA BIG;
MERGE MONTHS EMERYRAT; BY FROMZONE TOZONE;
IF TRANTYPE = 'Q';
IF TRANSPRI IN('1' '2');
IF SECSHIP='X';
IF SCALE = 'A' THEN DO;
  IF WGHT LE 874 THEN RATE =200;
  ELSE IF WGHT GE 875 AND WGHT LE 2571 THEN RATE=175;
  ELSE IF WGHT GE 2572 AND WGHT LE 4167 THEN RATE=150;
  ELSE IF WGHT GE 4168 AND WGHT LE 50000 THEN RATE=125;
END;

IF SCALE = 'B' THEN DO;
  IF WGHT LE 888 THEN RATE = 225;
  ELSE IF WGHT GE 889 AND WGHT LE 2625 THEN RATE=200;
  ELSE IF WGHT GE 2626 AND WGHT LE 4286 THEN RATE=175;
  ELSE IF WGHT GE 4287 AND WGHT LE 50000 THEN RATE=150;
END;

IF SCALE = 'C' THEN DO;
  IF WGHT LE 900 THEN RATE=250;
  ELSE IF WGHT GE 901 AND WGHT LE 2667 THEN RATE=225;
  ELSE IF WGHT GE 2668 AND WGHT LE 4375 THEN RATE=200;
  ELSE IF WGHT GE 4376 AND WGHT LE 50000 THEN RATE=175;
END;
  
```

```

IF SCALE = 'D' THEN DO;
  IF WGHT LE 909 THEN RATE = 275;
  ELSE IF WGHT GE 910 AND WGHT LE 2700 THEN RATE=250;
  ELSE IF WGHT GE 2701 AND WGHT LE 4444 THEN RATE=225;
  ELSE IF WGHT GE 4445 AND WGHT LE 50000 THEN RATE=200;
END;

IF SCALE = 'E' THEN DO;
  IF WGHT LE 917 THEN RATE = 300;
  ELSE IF WGHT GE 918 AND WGHT LE 2727 THEN RATE=275;
  ELSE IF WGHT GE 2728 AND WGHT LE 4500 THEN RATE=250;
  ELSE IF WGHT GE 4501 AND WGHT LE 50000 THEN RATE=225;
END;
WT100=WGHT/100;
BIGRATE = RATE*WT100;
IF BIGRATE < 55.00 THEN BIGRATE = 55.00;
DIFFRATE = BILL - BIGRATE;
PROC UNIVARIATE; VAR WGHT BILL BIGRATE DIFFRATE;

```



```

//CHITWOOD JOB (7291,9999),'CHITWOOD SAS',CLASS=C
// EXEC SAS
//WORK DD UNIT=SYSDA,SPACE=(CYL,(40,10))
//DATAIN DD DISP=SHR,DSN=MSS.S7291.AUGUST
// DD DISP=SHR,DSN=MSS.S7291.FEB
// DD DISP=SHR,DSN=MSS.S7291.MAY
// DD DISP=SHR,DSN=MSS.S7291.NOV
//SYSIN DD *
DATA MONTHS;
  INFILE DATAIN;
  INPUT WGHT 21-25
        CUBE 26-28
        QTRORIG $ 30-32
        QTRDEST $ 33-35
        UICTO $ 36-41
        UICFM $ 42-47
        TRANSPRI 48
        TRANTYPE $ 49
        SHIPDATE 55-59
        BILL 60-67
        DIMS $ 74-84
        DIMCODE $ 85
        HAZSHIP $ 86
        SECSHIP $ 87
        REFSHIP $ 88
        AIRCOMM $ 89-90
        PRJCDE $ 91-93
        RDD $ 94;
  IF TRANTYPE IN('C' 'N') OR (TRANSPRI IN('3' '4') AND TRANTYPE='Q');
  IF SECSHIP=' ';
  IF QTRORIG IN('AYI' 'GPT' 'MOB' 'NBG' 'NPA' 'PGL') THEN FROMZONE = 1;
  ELSE IF QTRORIG IN('BAL' 'DOV' 'NXX' 'PHL' 'PNE') THEN FROMZONE = 2;
  ELSE IF QTRORIG IN('BAT' 'BDR' 'BOS' 'BST' 'BTB' 'DAV' 'GON' 'HFD'
    'LYN' 'NCO' 'NHZ' 'NOA' 'NZW' 'OQU' 'PSM' 'PVD' 'PWM') THEN
    FROMZONE = 4;
  ELSE IF QTRORIG IN('BAY' 'EAR' 'LEO' 'NEL' 'NOP' 'PER' 'STN')
    THEN FROMZONE = 3;
  ELSE IF QTRORIG IN('CDD' 'CHC' 'CHS') THEN FROMZONE = 5;
  ELSE IF QTRORIG IN('COF') THEN FROMZONE = 6;
  ELSE IF QTRORIG IN('DAH' 'DCA' 'INH' 'NET' 'NGU' 'NHK' 'NKT'
    'TWH') THEN FROMZONE = 7;
  ELSE IF QTRORIG IN('IND') THEN FROMZONE = 8;
  ELSE IF QTRORIG IN('KBY' 'NIP') THEN FROMZONE = 9;
  ELSE IF QTRORIG IN('LGB' 'NTD' 'NZJ' 'NZY' 'PHU' 'SBD') THEN FROMZONE
    = 10;
  ELSE IF QTRORIG IN('NFL' 'NGZ' 'NLC' 'NUQ' 'OAK' 'SUU') THEN FROMZONE
    = 11;
  ELSE IF QTRORIG IN('NQX') THEN FROMZONE = 12;
  ELSE IF QTRORIG IN('NUW' 'PWT' 'TCM' 'TRF') THEN FROMZONE = 13;
  IF QTRDEST IN('AYI' 'GPT' 'MOB' 'NBG' 'NPA' 'PGL') THEN TOZONE = 1;
  ELSE IF QTRDEST IN('NJP' 'BAL' 'DOV' 'NXX' 'PHL' 'PNE') THEN TOZONE = 2;
  ELSE IF QTRDEST IN('BAT' 'BDR' 'BOS' 'BST' 'BTB' 'DAV' 'GON' 'HFD'

```

```

'LYN' 'NCO' 'NHZ' 'NOA' 'NZW' 'OQU' 'PSM' 'PVD' 'PWM') THEN
TOZONE = 4;
ELSE IF QTRDEST IN('BAY' 'EAR' 'LEO' 'NEL' 'NOP' 'PER' 'STN')
THEN TOZONE = 3;
ELSE IF QTRDEST IN('CDD' 'CHC' 'CHS') THEN TOZONE = 5;
ELSE IF QTRDEST IN('COF') THEN TOZONE = 6;
ELSE IF QTRDEST IN('DAH' 'DCA' 'INH' 'NET' 'NGU' 'NHK' 'NKT'
'TWH') THEN TOZONE = 7;
ELSE IF QTRDEST IN('IND') THEN TOZONE = 8;
ELSE IF QTRDEST IN('KBY' 'NIP') THEN TOZONE = 9;
ELSE IF QTRDEST IN('LGB' 'NTD' 'NZJ' 'NZY' 'NSI' 'PHU' 'SBD') THEN
TOZONE = 10;
ELSE IF QTRDEST IN('NFL' 'NGZ' 'NLC' 'NUQ' 'OAK' 'SUU') THEN TOZONE
= 11;
ELSE IF QTRDEST IN('NQX') THEN TOZONE = 12;
ELSE IF QTRDEST IN('NUW' 'PWT' 'TCM' 'TRF') THEN TOZONE = 13;
PROC SORT; BY FROMZONE TOZONE;
DATA CLASS100;
    INPUT FROMZONE 1-2
           TOZONE 4-5
           MILES 7-10
           RATE 12-15;

```

CARDS;

```

1 1 95 1373
1 2 1058 3790
1 3 1172 4166
1 4 1324 4306
1 5 526 2666
1 6 500 2558
1 7 855 3450
1 8 718 3098
1 9 353 2217
1 10 1878 5014
1 11 2372 5575
1 12 809 3370
1 13 2713 6003
2 1 1058 3790
2 2 79 1373
2 3 115 1536
2 4 267 2003
2 5 636 2965
2 6 1010 3716
2 7 264 2003
2 8 630 2965
2 9 836 3410
2 10 2518 5791
2 11 2821 6106
2 12 1336 4306
2 13 2778 6003
3 1 1172 4166
3 2 115 1536
3 3 40 1179

```

3	4	176	1455
3	5	750	3130
3	6	1124	4095
3	7	375	2217
3	8	723	3098
3	9	950	3566
3	10	2761	6003
3	11	2878	6106
3	12	1450	4443
3	13	2835	6106
4	1	1324	4306
4	2	267	2003
4	3	176	1819
4	4	203	1895
4	5	902	3528
4	6	1276	4265
4	7	527	2666
4	8	875	3450
4	9	1102	4095
4	10	2913	6209
4	11	3030	6409
4	12	1602	4704
4	13	2987	6209
5	1	526	2133
5	2	636	2965
5	3	750	3130
5	4	902	3528
5	5	10	1179
5	6	415	2443
5	7	396	2364
5	8	687	3033
5	9	241	1956
5	10	2386	5575
5	11	2749	6003
5	12	741	3130
5	13	2896	6106
6	1	500	2558
6	2	1010	3716
6	3	1124	4095
6	4	1276	4265
6	5	415	2443
6	6	10	1179
6	7	770	3163
6	8	990	3642
6	9	174	1680
6	10	2461	5684
6	11	2866	6106
6	12	329	2177
6	13	3118	6409
7	1	855	3450
7	2	264	2003
7	3	375	2217

7	4	527	2666
7	5	396	2364
7	6	770	3163
7	7	173	1680
7	8	700	3033
7	9	596	2860
7	10	2637	5898
7	11	2891	6106
7	12	1096	3790
7	13	2896	6106
8	1	718	3098
8	2	630	2965
8	3	723	3098
8	4	875	3450
8	5	687	3033
8	6	990	3642
8	7	700	3033
8	8	10	1179
8	9	816	3370
8	10	2038	5250
8	11	2197	5364
8	12	1314	4306
8	13	2209	5464
9	1	353	2217
9	2	836	3410
9	3	950	3566
9	4	1102	4095
9	5	241	1956
9	6	174	1680
9	7	596	2860
9	8	816	3370
9	9	71	1284
9	10	2313	5575
9	11	2718	6003
9	12	500	2558
9	13	2944	6209
10	1	1897	5014
10	2	2518	5791
10	3	2761	6003
10	4	2913	6209
10	5	2386	5575
10	6	2461	5684
10	7	2637	5898
10	8	2038	5250
10	9	2313	5575
10	10	107	1536
10	11	513	2630
10	12	2770	6003
10	13	1252	4265
11	1	2372	5575
11	2	2821	6106
11	3	2878	6106

```

11 4 3030 6309
11 5 2749 6003
11 6 2866 6106
11 7 2891 6106
11 8 2197 5364
11 9 2718 6003
11 10 513 2630
11 11 400 2364
11 12 3175 6409
11 13 760 3163
12 1 809 3370
12 2 1336 4306
12 3 1450 4443
12 4 1602 4704
12 5 741 3130
12 6 329 2177
12 7 1096 3790
12 8 1314 4306
12 9 500 2558
12 10 2770 6003
12 11 3175 6409
12 12 10 1179
12 13 3437 6701
13 1 2713 6003
13 2 2778 6003
13 3 2835 6106
13 4 2987 6209
13 5 2896 6106
13 6 3118 6409
13 7 2896 6106
13 8 2209 5464
13 9 2944 6209
13 10 1252 4265
13 11 760 3163
13 12 3437 6701
13 13 32 1179
;
PROC SORT; BY FROMZONE TOZONE;
DATA PACKAGES;
    SET MONTHS;
PROC SORT; BY UICFM UICTO SHIPDATE;
PROC MEANS NOPRINT;
    VAR WGHT FROMZONE TOZONE BILL;
    BY UICFM UICTO SHIPDATE;
OUTPUT OUT=SHIPMENT SUM(WGHT)= MEAN(FROMZONE)= MEAN(TOZONE)= SUM(BILL)= ;
PROC SORT DATA=SHIPMENT; BY FROMZONE TOZONE;
DATA LTLRATE;
MERGE SHIPMENT CLASS100; BY FROMZONE TOZONE;
IF WGHT < 500 THEN LTLRATE = WGHT*.0001*RATE;
IF WGHT > 499 AND WGHT < 1000 THEN LTLRATE = WGHT*.0001*RATE*.8;
IF WGHT > 999 AND WGHT < 2000 THEN LTLRATE = WGHT*.0001*RATE*.68;
IF WGHT > 1999 AND WGHT < 5000 THEN LTLRATE = WGHT*.0001*RATE*.59;

```

```
IF WGHT > 4999 AND WGHT <10000 THEN LTLRATE = WGHT*.0001*RATE*.515;  
IF WGHT > 9999 AND WGHT <20000 THEN LTLRATE = WGHT*.0001*RATE*.44;  
IF WGHT >19999 AND WGHT <30000 THEN LTLRATE = WGHT*.0001*RATE*.395;  
IF WGHT >29999 AND WGHT <40000 THEN LTLRATE = WGHT*.0001*RATE*.345;  
IF WGHT >39999 THEN LTLRATE = WGHT*.0001*RATE*.325;  
IF LTLRATE >= 100 THEN GBL=1;  
IF LTLRATE < 100 THEN CBL=1;  
DIFFCOST = BILL - LTLRATE;  
PROC UNIVARIATE;  
VAR GBL CBL WGHT BILL LTLRATE DIFFCOST;  
PROC PRINT; OPTIONS 100; VAR FROMZONE TOZONE UICFM UICTO  
WGHT BILL LTLRATE;
```

```

//CHITWOOD JOB (7291,9999),'CHITWOOD SAS',CLASS=C
// EXEC SAS
//WORK DD UNIT=SYSDA,SPACE=(CYL,(40,10))
//DATAIN DD DISP=SHR,DSN=MSS.S7291.AUGUST
// DD DISP=SHR,DSN=MSS.S7291.FEB
// DD DISP=SHR,DSN=MSS.S7291.MAY
// DD DISP=SHR,DSN=MSS.S7291.NOV
//SYSIN DD *
DATA AUGUST;
  INFILE DATAIN;
  INPUT WGHT 21-25
        CUBE 26-28
        QTRORIG $ 30-32
        QTRDEST $ 33-35
        UICTO $ 36-41
        UICFM $ 42-47
        TRANSPRI 48
        TRANTYPE $ 49
        SHIPDATE 55-59
        BILL 60-67
        DIMS $ 74-84
        DIMCODE $ 85
        HAZSHIP $ 86
        SECSHIP $ 87
        REFSHIP $ 88
        AIRCOMM $ 89
        SHCODE $ 90
        PRJCDE $ 91-93
        RDD $ 94;
  IF (TRANSPRI IN('3' '4') AND TRANTYPE IN('Q')) OR TRANTYPE IN('C' 'N');
  IF SECSHIP='X';
  IF QTRORIG IN('AYI' 'GPT' 'MOB' 'NBG' 'NPA' 'PGL') THEN FROMZONE = 1;
  ELSE IF QTRORIG IN('BAL' 'DOV' 'NXX' 'PHL' 'PNE') THEN FROMZONE = 2;
  ELSE IF QTRORIG IN('BAT' 'BDR' 'BOS' 'BST' 'BTV' 'DAV' 'ON' 'HFD'
    'LYN' 'NCO' 'NHZ' 'NOA' 'NZW' 'OQU' 'PSM' 'PVD' 'PWM') THEN
  FROMZONE = 4;
  ELSE IF QTRORIG IN('BAY' 'EAR' 'LEO' 'NEL' 'NOP' 'PER' 'STN')
  THEN FROMZONE = 3;
  ELSE IF QTRORIG IN('CDD' 'CHC' 'CHS') THEN FROMZONE = 5;
  ELSE IF QTRORIG IN('COF') THEN FROMZONE = 6;
  ELSE IF QTRORIG IN('DAH' 'DCA' 'INH' 'NET' 'NGU' 'NHK' 'NKT'
    'TWH') THEN FROMZONE = 7;
  ELSE IF QTRORIG IN('IND') THEN FROMZONE = 8;
  ELSE IF QTRORIG IN('KBY' 'NIP') THEN FROMZONE = 9;
  ELSE IF QTRORIG IN('LGB' 'NTD' 'NZJ' 'NZY' 'PHU' 'SBD') THEN FROMZONE
  = 10;
  ELSE IF QTRORIG IN('NFL' 'NGZ' 'NLC' 'NUQ' 'OAK' 'SUU') THEN FROMZONE
  = 11;
  ELSE IF QTRORIG IN('NQX') THEN FROMZONE = 12;
  ELSE IF QTRORIG IN('NUW' 'PWT' 'TCM' 'TRF') THEN FROMZONE = 13;
  IF QTRDEST IN('AYI' 'GPT' 'MOB' 'NBG' 'NPA' 'PGL') THEN TOZONE = 1;
  ELSE IF QTRDEST IN('NJP' 'BAL' 'DOV' 'NXX' 'PHL' 'PNE') THEN TOZONE = 2;

```

```

ELSE IF QTRDEST IN('BAT' 'BDR' 'BOS' 'BST' 'BTV' 'DAV' 'GON' 'HFD'
'LYN' 'NCO' 'NHZ' 'NOA' 'NZW' 'OQU' 'PSM' 'PVD' 'PWM') THEN
TOZONE = 4;
ELSE IF QTRDEST IN('BAY' 'EAR' 'LEO' 'NEL' 'NOP' 'PER' 'STN')
THEN TOZONE = 3;
ELSE IF QTRDEST IN('CDD' 'CHC' 'CHS') THEN TOZONE = 5;
ELSE IF QTRDEST IN('COF') THEN TOZONE = 6;
ELSE IF QTRDEST IN('DAH' 'DCA' 'INH' 'NET' 'NGU' 'NHK' 'NKT'
'TWH') THEN TOZONE = 7;
ELSE IF QTRDEST IN('IND') THEN TOZONE = 8;
ELSE IF QTRDEST IN('KBY' 'NIP') THEN TOZONE = 9;
ELSE IF QTRDEST IN('LGB' 'NTD' 'NZJ' 'NZY' 'NSI' 'PHU' 'SBD') THEN
TOZONE = 10;
ELSE IF QTRDEST IN('NFL' 'NGZ' 'NLC' 'NUQ' 'OAK' 'SUU') THEN TOZONE
= 11;
ELSE IF QTRDEST IN('NQX') THEN TOZONE = 12;
ELSE IF QTRDEST IN('NUW' 'PWT' 'TCM' 'TRF') THEN TOZONE = 13;
PROC SORT; BY FROMZONE TOZONE;
DATA CLASS100;
    INPUT FROMZONE 1-2
          TOZONE 4-5
          MILES 7-10;

```

CARDS;

```

1 1 95
1 2 1058
1 3 1172
1 4 1324
1 5 526
1 6 500
1 7 855
1 8 718
1 9 353
1 10 1878
1 11 2372
1 12 809
1 13 2713
2 1 1058
2 2 79
2 3 115
2 4 267
2 5 636
2 6 1010
2 7 264
2 8 630
2 9 836
2 10 2518
2 11 2821
2 12 1336
2 13 2778
3 1 1172
3 2 115
3 3 40

```


3	4	176
3	5	750
3	6	1124
3	7	375
3	8	723
3	9	950
3	10	2761
3	11	2878
3	12	1450
3	13	2835
4	1	1324
4	2	267
4	3	176
4	4	203
4	5	902
4	6	1276
4	7	527
4	8	875
4	9	1102
4	10	2913
4	11	3030
4	12	1602
4	13	2987
5	1	526
5	2	636
5	3	750
5	4	902
5	5	10
5	6	415
5	7	396
5	8	687
5	9	241
5	10	2386
5	11	2749
5	12	741
5	13	2896
6	1	500
6	2	1010
6	3	1124
6	4	1276
6	5	415
6	6	10
6	7	770
6	8	990
6	9	174
6	10	2461
6	11	2866
6	12	329
6	13	3118
7	1	855
7	2	264
7	3	375

7	4	527
7	5	396
7	6	770
7	7	173
7	8	700
7	9	596
7	10	2637
7	11	2891
7	12	1096
7	13	2896
8	1	718
8	2	630
8	3	723
8	4	875
8	5	687
8	6	990
8	7	700
8	8	10
8	9	816
8	10	2038
8	11	2197
8	12	1314
8	13	2209
9	1	353
9	2	836
9	3	950
9	4	1102
9	5	241
9	6	174
9	7	596
9	8	816
9	9	71
9	10	2313
9	11	2718
9	12	500
9	13	2944
10	1	1897
10	2	2518
10	3	2761
10	4	2913
10	5	2386
10	6	2461
10	7	2637
10	8	2038
10	9	2313
10	10	107
10	11	513
10	12	2770
10	13	1252
11	1	2372
11	2	2821
11	3	2878

```

11 4 3030
11 5 2749
11 6 2866
11 7 2891
11 8 2197
11 9 2718
11 10 513
11 11 400
11 12 3175
11 13 760
12 1 809
12 2 1336
12 3 1450
12 4 1602
12 5 741
12 6 329
12 7 1096
12 8 1314
12 9 500
12 10 2770
12 11 3175
12 12 10
12 13 3437
13 1 2713
13 2 2778
13 3 2835
13 4 2987
13 5 2896
13 6 3118
13 7 2896
13 8 2209
13 9 2944
13 10 1252
13 11 760
13 12 3437
13 13 32
;
PROC SORT; BY FROMZONE TOZONE;
DATA PACKAGES;
    SET MONTHS;
PROC SORT; BY UIC TO UICFM SHIPDATE;
PROC MEANS NOPRINT;
    VAR WGHT FROMZONE TOZONE BILL;
    BY UIC TO UICFM SHIPDATE;
OUTPUT OUT=SHIPMENT SUM(WGHT)= MEAN(FROMZONE)= MEAN( TOZONE)= SUM(BILL)= ;
PROC SORT DATA=SHIPMENT; BY FROMZONE TOZONE;
DATA SECRATE;
MERGE SHIPMENT CLASS100; BY FROMZONE TOZONE;
IF WGHT > 0 AND WGHT < 2500 THEN WGHT = 2500;
IF WGHT > 0 THEN SECRATE =
(((MILES/100)*1.3)+ 16.15)*(WGHT/100) + (MILES*.34);
IF SECRATE >= 100 THEN GBL=1;

```

```
IF SECRATE < 100 THEN CBL=1;  
DIFFCOST = BILL - SECRATE;  
PROC UNIVARIATE;  
VAR GBL CBL WGHT BILL SECRATE DIFFCOST;
```

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